TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 20.] 1923. [No. 4.

MEDICAL ENTOMOLOGY: A RETROSPECT.

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Since the publication of the first Review of the progress of Medical Zoology in this *Bulletin* [ALCOCK (1921)], 265 papers relating to Medical Entomology have been noticed in these pages. If some of these papers have not originated in any observations made in the tropics, the explanation is that medical zoology, as represented in this *Bulletin*, must look everywhere for facts possible of further elucidation and principles capable of application in tropical countries, and also for ideas—such as those evoked by CRAGG's (1920 *a*) remarkable observations on the behaviour of the spermatozoa of the bed-bug—abounding in general biological and pathological significance.

In this present Retrospect from December, 1922, back to July, 1921, such of those papers, already noticed here, as appear to be of more than ordinary importance are reconsidered from a larger point of view —along with some ancient history of the Linguatulida which it seems opportune, now that these parasites are coming so much under observation in tropical Africa, to resuscitate.

Intrinsic Character of the Water as a Possible Influence on the Breeding of Anopheles.—Every one now knows that, though some species are more fastidious than others, particular species of Anopheles have particular preferences in the matter of breeding-places—that the larvae of a given species are not found indiscriminately in water of any and every kind. There has undoubtedly been an impression that the choice of aquatic habitat is governed by the obvious features of the environment, although many years ago that penetrating observer Malcolm WATSON suspected that it might be influenced in subtler ways by the composition or character of the water itself. In the latest edition of his book, "The Prevention of Malaria," (1921), WATSON quotes his early speculations on this subject and his anticipations of a time when, in the fullness of knowledge, malaria might be abolished at small expense by biological methods and elaborate drainage schemes might become obsolete. Recent researches by LAMBORN (1922) in Malaya, although, unfortunately, they were not completed, tend on the whole to support one aspect of WATSON's theory. LAMBORN by no means confines his attention to a single species, but he has selected a common species, *Anopheles aconitus*, for continued observation, and he has observed that in a cluster of ponds in the same tract, apparently

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differing *inter se* only in such a purely intrinsic feature as the relative amount of floating water-weed, the larvae of *A. aconitus* may be predominant above all other species in some ponds and be unrepresented among the larvae collected in other ponds. This accomplished observer concludes, with regard to *A. aconitus* at least, that its distribution is affected by some quality of the water—some quality which either directly or indirectly influences the food-supply. He does not say much about the composition of the aquatic flora of the ponds; but it is known (METZ (1919), and CABALLERO (1919)) that certain common kinds of water-weed do exercise an adverse influence on certain mosquito larvae under experimental conditions; and CABALLERO (1920), who has carried his observations into Nature, is satisfied that there are three species of algae of the cosmopolitan genus Chara which under natural conditions also are in some way—possibly indirect—inhibitive to mosquito larvae. Observations by MACGREGOR (1921) also, on the influence of the hydrogen-ion concentration in the development of mosquito larvae, have another bearing on this question.

Unusual Breeding-places for Mosquitoes.—It is common knowledge that certain species, both of anophelines and culicines, breed exclusively in trees, but HAWORTH (1922), in East Africa, has found larvae of *Anopheles costalis*, along with *Culex fatigans*, *Stegomyia fasciata*, and other species, in the tops of coconut palms. This is not an isolated phenomenon; in the course of about six months in each township 2,889 palms in Tanga yielded 1,418 collections of larvae, and 1,673 palms in Dar-es-Salaam 1,549 collections, the totality of observations comprising a whole year and thus including the dry season.

Length of Life and Duration of Malarial Infection in Anopheles.—Bruce MAYNE (1922) has incidentally confirmed the well-enough-known fact that some species of Anopheles can live for several months; but in working with *A. punctipennis* he found that individual insects infected with the malaria parasite could be actually infective to man 55 days, and could retain active sporozoites in the salivary glands 70 days, after the original infective repast.

The Protective Influence of Domestic Animals against Malaria.—The fact that in the most politic and prosperous parts of Western Europe malaria, once so prevalent, practically disappeared long before any exact knowledge of its causation and prevention had been gained, while the Anopheles capable of maintaining the infection remain to this day, has impressed many people. Most people would be content to regard this impotence of the local Anopheles as one of the many ulterior consequences of western civilization—as a side issue of the disciplined industry that results in the subjugation of the powers of the jungle. ROUBAUD (1921 *a*) (1922), however, sees in the modern management of domestic cattle the one circumstance that has freed Western Europe from malaria. According to him the Anopheles here have turned their attention exclusively to conveniently congregated cattle, which they much prefer to man, and so have abandoned their indispensable place in the malaria connexion. So far has this adaptation to cattle gone that structural modifications in the insects' maxillae are said to have occurred. Dissent from this special pleading does not imply ignorance of the fact that one of the commonest European species of Anopheles congregates in cattle sheds and stables in cool weather and can then, if necessary, be destroyed in large numbers. But the theory itself reminds one of that theory of BUCKLE's which attributed all the distress of Ireland to the introduction of the potato.

Destruction of Larvae of Stegomyia fasciata.—The stocking of domestic water-vessels with small fish has proved a most efficient method in the experience of the Rockefeller Yellow Fever Commissions in Central and South America [ROCKEFELLER FOUNDATION (1922)]. CONNOR (1920) also describes the success of this method in Guayaquil. MACFIE (1921) finds that sea-water is sufficiently destructive to larvae of *Stegomyia fasciata,* and is of opinion that it might be used, where available, for this purpose in municipal flushing operations.

Phlebotomus and Oriental Sore, etc.—Though recent experiments have much strengthened the hypothesis that Phlebotomus transmits the parasite of Oriental sore, they still fall short of conclusive proof that this insect is either its necessary intermediary or the prime natural source of infection. The latest work of the brothers SERGENT (1921) and their collaborators in N. Africa, and of ARAGÃO (1922) in Brazil, proves that Phlebotomus taken from a focus of infection (or from an actual case) may be infective when crushed and inoculated within three or four days ; but, as WENYON remarks, it is probable that the same result could be obtained with crushed bed-bugs if they were used at so short an interval after ingesting the parasite.

It is pertinent to draw attention to PRINGAULT's discovery (1921) of spirochaetes in the gut of *Phlebotomus perniciosus.*

LARROUSSE's memoir (1921) on Phlebotomus and the compendious, though rather abstrusely technical, papers of FRANÇA (1919) and FRANÇA and PARROT (1920) must again be mentioned, though a monograph of this genus, based on extensive collections from all parts of the world, is still a desideratum.

Simulium and Pellagra.—This theory " has apparently died a natural death," and regular readers of this *Bulletin,* at any rate, need hardly be reminded of BIGLAND's (1922) erudite review of the literature of pellagra, where the conjectured aetiological factors are appraised ; though rash entomologists who have affirmed the Simulium theory to be proved may benefit by study of it.

Chrysops and Loaiasis.—Nearly thirty years ago MANSON surmised that *Chrysops dimidiata* was the intermediary host of *Loa loa,* a surmise that was subsequently justified by the observations of LEIPER and of KLEINE. The development of the worm in *Chrysops silacea* and *dimidiata* has now been carefully investigated and fully described by the CONNALS (1921). Although most of the embryos escape from their sheath within a few hours of ingestion, some may remain ensheathed, and alive and active in the stomach of the fly, for as long as three days ; hence in course of time there is considerable disparity in the size of the developing forms. Usually, however, most of the embryos have freed themselves and made their way through the stomach-wall of their nurse in about six hours. Preferably they settle, to begin with, in the abdomen of the fly, where they greatly increase in breadth. In the course of the third day the alimentary canal is complete ; a simple mouth is formed, and the anus opens out of a subterminal vesicle. On the sixth day the larva moults, piecemeal, and the tail-end becomes trilobed. From this time onwards there is rapid increase in length. On the seventh day the larvae are very freely locomotive ; they may be found far down the legs of their host, and in the halteres and the root of the wings, but most of them tend towards the head, where on the tenth day they are found congregated about the root of the proboscis, ready for migration to their final host. In their passage from the fly they travel rapidly down the labium and escape between the labella. Several hundreds have been observed to

leave a single fly. When a heavily infected fly is feeding the larvae may be seen passing on to the victim's skin in a continuous glistening stream ; the fly is sometimes disquieted by such a flood of larvae, and may brush them off and flick them about with its front legs. No suggestion of pairing-off of migrating larvae was observed. No satisfactory answer can be given to the question of the duration of infectivity of the fly, as the flies were all captives under experiment ; none of these lived more than fourteen days after becoming infected.

MARCHAND's memoir (1920) on the early stages of Tabanidae must again be brought to general notice.

The Problem of Tsetse-fly Control.—In a noteworthy paper on Tsetse-flies and Trypanosomiasis in French West Africa, ROUBAUD (1920) stigmatizes *G. palpalis* as the species above all others that has proclivities for man, and signalizes *G. morsitans* as the species most exclusively restricted to game. Attracted by the observation that certain breeds of domestic animals—notably the small N'dama cattle and the Malinké and other N'dama derived breeds—are refractory to trypanosomiasis, and that the integuments of the dwarf Fouta goat are impervious to the fly, he thinks that such animals could be installed as screens to villages. In contrast with this seductive indirect method, DAWE (1922) robustly proposes extensive cultivation of Eftwatakala (*Melinis minutiflora*), a grass said to be offensive and destructive to insects by its smell and stickiness. SWYNNERTON (1921), in a paper distinguished alike for breadth of view and careful attention to detail, appears at present to have most confidence in properly planned and directed, periodic, clearing and burning. One item of SWYNNERTON's historical survey deserves to be widely propagated ; it tells how a stubborn Zulu chief unwittingly expelled *G. morsitans*, and probably some other species, from a tract of jungle without any special attack on its game. This chief, in defiance of fly, settled his tribe, cattle and all, in a fly-belt. The belt being soon cleared and put under cultivation became free of fly and safe for cattle ; it also became scarce of game, and to this fact the people attributed the disappearance of fly. But—and this is the interesting point—the fly also disappeared from a tract of chiefly deciduous, game-tenanted jungle beyond the reclaimed belt, so that it too became quite safe for cattle—a comforting illustration of the old truth that " our indiscretions sometimes serve us well, when our deep plots do pall," and also a parallel to the unpremeditated course of events by which, in England, Anopheles was quietly pushed into the background. It also justifies FISKE's (1920) argument that the likeliest way of getting rid of *G. palpalis* in troublesome areas is to promote the industries by which the local populations grow strong and multiply and at last become victorious over the jungle. So well satisfied does FISKE seem to be with this argument that a considerable part of his Uganda Fly Report for 1920 is devoted to an economic study of the local fisheries and fuel industries.

If a simple Zulu chief could get tsetse-fly out of a tract of virgin jungle without thought or intention, is it not possible that in the irony of Nature a clever plan to starve out the fly merely by destroying its natural hosts may have ulterior consequences quite as unsuspected ? An answer to this question is suggested by another undesigned experiment, made in England, and related by the Hon. Gerald LASCELLES in his " Thirty-five Years in the New Forest." The author tells how the commoners persistently objected to the wild deer of the forest, which consumed the pasture of their cattle, and how at last the

offending deer were removed by Act of Parliament. But "instead of the pasture being increased by the removal of the deer, the contrary was the case. The deer had been invaluable in keeping down the . . . rough undergrowth, which, after their removal, began to encroach on the lawns, where alone the best pasturage grows." So that "there is less pasturage in the open forest now, when 6,000 deer have been taken off it, than there was when they were alive and grazing alongside the cattle." One can hardly find a better lesson on the danger of being too suddenly familiar with Nature.

Muscaria.—The term of life of the house-fly (*Musca domestica*), under normal conditions of sexual activity, has been much debated and is commonly believed to be about six weeks, but ROUBAUD (1921 *b*) finds that if the food contains nitrogen the insect can live nearly twice as long, and KOBAYASHI's (1921) Corean house-flies fed on moistened biscuit were kept alive for 101 to 120 days, the females sometimes depositing eggs.

The carefully reported observations of BISHOP and LAAKE (1921) show that common flies can make much longer flights than is commonly supposed, and that when set free in the open they do not always settle at the first apparently suitable spot. The longest distance travelled by *Musca domestica* in these observations was over 13 miles, and this distance was exceeded by two miles by the screw-worm fly (*Cochliomyia macellaria*).

The question whether maggots that have fed on matter infected with pathogenetic organisms can retain the infection until they issue in the adult stage has been fully discussed in GRAHAM-SMITH's "Non-Bloodsucking Flies," where it is concluded that although the maggot itself may not remain infected, yet if when it pupates the surface of the puparium remain in contact with the infected material the presently emerging fly may become infected from inevitable contact with the puparium. This conclusion has lately been confirmed by WOLLMAN (1921), who finds that if a maggot be fed with bacilli (typhosus, dysentericus, tuberculosis, and anthracis), bacilli can be recovered from the pupa, but not from the issuing fly if the surface of the puparium be sterilized. Since maggots do not as a rule pupate in their pabulum, the possibility of flies becoming infected from pathogenetic organisms in the pabulum of the larvae is, as TEBBUTT (quoted by GRAHAM-SMITH) had concluded, very remote.

Geographical Distribution of Rat-fleas in Relation to the Epidemiology of Plague in India.—CRAGG's (1920 *b*) laborious work on the species of Xenopsylla parasitic on Indian rats and on the geographical distribution of these species as a possible factor in the epidemiology of plague in India (1921) deserves further investigation. There are, as is well known, certain parts of India to which, in recent history, plague has never penetrated, or which it may have occasionally reached but without epidemic consequences. So long as all the flea-parasites of the ubiquitous rat were assumed to be *Xenopsylla cheopis*—a notoriously dangerous character—this remarkable phenomenon was "wrapped in mystery." CRAGG, however, finds that although in the *general* census *X. cheopis* is the predominant species, yet there are two other Indian rat-fleas—*X. astia* and *X. brasiliensis*—of which the former is the predominant and sometimes very greatly predominant rat parasite in *particular* localities. He finds, furthermore—so far as he can judge from collections of rat-fleas that have come into his hands—some suggestive correspondences between the localities where the predominant rat-flea is *X. astia* and the localities that have never

been stricken (or heavily stricken) with plague ; and he is thus led to infer, what can only be conclusively settled by investigation of the reaction of this particular species to the plague bacillus, that *X. astia* may be an innocent flea.

It may be mentioned that, as regards the male sex, *X. brasiliensis* can easily be distinguished from the other two species by the long pedicle of the antepygidial bristle, and *X. astia* from *X. cheopis* by the very different form of the ninth abdominal sternite ; and that the females of the three species differ very obviously *inter se* in the shape and size of the spermatheca. All these differences are exhibited in the accompanying figures.

Is the Virus of Typhus Fever heritable by the Louse ?—Authorities are not in agreement on this question. SERGENT, FOLEY and VIALETTE (1921) concluded, apparently from having successfully transmitted the disease by inoculating nits taken from a typhus patient, that the infection is transmitted to progeny. NICOLLE, BLANC and CONSEIL, using not nits from an infected parent but young lice hatched from such nits, were not successful in transmitting the disease, and concluded that the infection is not transmitted to progeny. NICOLLE's explanation (1921) of the discrepancy in these results is that the nits used in the Sergent experiments must have become contaminated superficially by contact with the infective faeces of the parent. Judging by analogy with WOLLMAN's experiments comparing infected with superficially-sterilized house-fly puparia, NICOLLE's explanation seems reasonable ; at any rate he holds to his experimental conclusion.

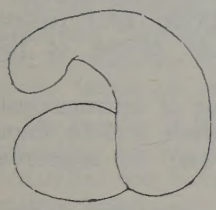
Insect Flagellates.—In a former retrospect [ALCOCK (1921)] reference was made to the discordance between the results obtained by HOARE and those obtained by authors who hold that the leishmaniases of vertebrate animals are vicarious herpetomoniases of insects. This discordance has now been expressed by BUCHNER (1922), who failed to verify the results reported by LAVERAN and FRANCHINI on repeating those observers' experiments of injecting the flagellates inhabiting the gut of the sheep-ked into white mice. HOARE (1922) also has confirmed NÖLLER's account of the crithidia of the ked as the antecedent form of the trypanosome of the sheep—a trypanosome which, according to HOARE, is not pathogenetic to the sheep in ordinary circumstances. It appears from HOARE's observations that the sheep is infected not by the bite of the ked, but in some other way.

Tick-borne Diseases.—Experiments conducted by BATES, DUNN, and ST. JOHN (1921) have proved *Ornithodorus talaje* to be the intermediary infective agent of relapsing fever in Panama. Patients suffering from the disease gave an account of having been badly bitten by ticks two or three weeks before admission to hospital ; *O. talaje* was discovered in the huts where the patients had slept at that time ; and from these ticks the disease was communicated experimentally, first to rats and to human beings, and thence subsequently to other laboratory animals ; spirochaetes indistinguishable from the human type were also found in the coelom-fluid of the ticks.

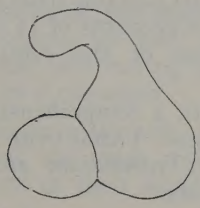
HAROLD (1922) gives circumstantial evidence tending to inculpate *Ornithodorus lahorensis* as a carrier of relapsing fever in Persia.

Attention is certainly due once more to two interesting and suggestive papers by MEGAW (1921). One of these deals with a typhus-like fever, often mistaken for some form of paratyphoid, which occurs in Kumaon and neighbouring foot-hills of the north-west Himalayas. MEGAW more than suspects that this fever is communicated to man by ticks of some sort, and provisionally he classifies it along with Rocky

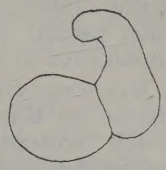
DIAGNOSTIC CHARACTERS OF SOME XENOPSYLLA RAT-FLEAS



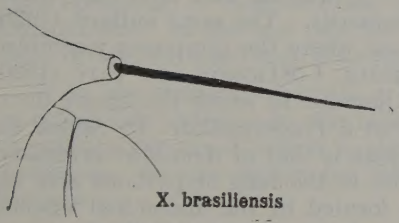
X. cheopis spermatheca



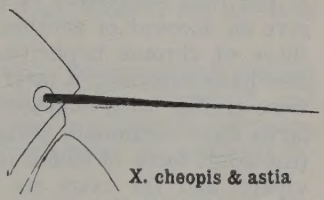
X. astia spermatheca



X. brasiliensis spermatheca

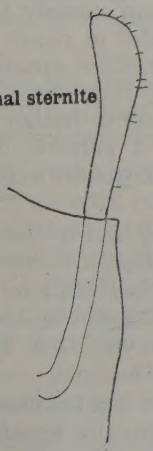


X. brasiliensis
antepygidial bristle on long pedicle



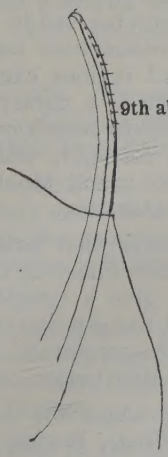
X. cheopis & astia
antepygidial bristle on tubercle

9th abdominal sternite



X. cheopis

9th abdominal sternite



X. astia

Mountain Fever in one of three sections of a typhus-group of diseases of which the other two sections are respectively exemplified by louse-borne typhus and tsutsugamushi disease.

In the other paper MEGAW suggests that a twelve-day fever recently reported from Nigeria may also find a place among tick-borne or mite-borne fevers of the typhus group.

Tick-bite Paralysis.—MCCORNACK (1921) has given a useful review of this subject, along with accounts of 11 cases. DODD (1921) records some careful observations of the symptoms and course of this intoxication in animals.

Mite-borne Diseases.—In a comprehensive review of tsutsugamushi disease by KAWAMURA and YAMAGUCHI (1921) there will be found a full account of the *Trombidium akamushi* and its numerous mammalian and avian hosts.

The Linguatulida or Pentastomida.—Infestation with the encysted larval and "nymphal" forms of Linguatulids seems, from recent observations, to be common in certain parts of tropical Africa, especially among tribes who eat snakes. MOUCHET states that he has found them in Leopoldville in over 22 per cent. of his post-mortem investigations. NOC and NOGUE (1919) report a very dreadful and fatal case which at first was suggestive of trypanosomiasis. The same authors (1920) give an account of another fatal case where the symptoms resembled those of chronic nephritis. MONZIOLS, COLLIGNON and ROY (1920) also have described a fatal case of jaundice in which the biliary ducts were stuffed with encysted larvae of a Porocephalid. In Africa the larva most commonly parasitic in man is that of *Armillifer armillatus* (the adult form of which is parasitic in the lung of pythons and big vipers) and the cysts are usually located in the abdominal viscera, particularly the liver and omentum, but sometimes in the lung and other organs. The recent papers of SAMBON (1922) on the classification, distribution and host-incidence of these remarkable Arthropod endoparasites are therefore opportune.

In the catalogue of Linguatulid hosts, SAMBON names five species as having been observed in the larval stage in man, namely *Linguatula serrata* (= *Pentastomum taenioides*), parasitic also in many domestic animals in all regions except Australia; *Armillifer armillatus*, the adult of which is a parasite of pythons and certain large vipers in Africa; *Armillifer moniliformis*, occurring as adult in Indian pythons; *Porocephalus subulifer*, which as an adult is a parasite of certain African snakes; and (doubtfully) *Porocephalus crotali*, a parasite of rattlesnakes (America).

As it is possible that further investigation may lead to the discovery of other species infesting man in their larval stages, it may perhaps be useful to give a conspectus of SAMBON's classification. For the definitions of the genera included in this author's scheme the original papers must be consulted; we can here mention only their final hosts, geographical distribution, and striking characters.

SAMBON arranges the Linguatulidae in two subfamilies, namely (1) *Raillietiellinae*, having the uterus sacciform, the female genital-opening at the anterior end of the abdomen, the mouth anterior to the hooks, and the salivary glands (which are easily visible in a fixed and cleared specimen) moderately developed; and (2) *Porocephalinae*, having a greatly-elongate, coiled, tubular uterus, the female genital-opening at the posterior end of the body, the mouth in line with or

posterior to the hooks, and the salivary glands extending the whole length of the body.

The only criticism that must be made here is that since the oldest genus in the subfamily "Porocephalinae" is *Linguatula*, Fröhlich (1789), the subfamily name should be Linguatulinae, not Porocephalinae.

In the subfamily Raillietiellinae two genera are included—*Raillietiella* and *Reighardia*, the species in both being worm-like in form and of moderate or small size, and having the mouth anterior to the hooks, which are arranged in a trapezoid.

The species of Raillietiella have the end of the tail bifid, are found, according to SAMBON, in all the great regions of the globe except Australia, and have as hosts in their adult stage various species of snakes, lizards and a toad.

The single species of Reighardia has the tip of the tail rounded, and in its adult stage is a parasite of several wide-ranging gulls and a wide-ranging tern.

SAMBON arranges the subfamily Linguatulinae (or, as he calls it, Porocephalinae) in three sections, namely Sebekini, Porocephalini, and Linguatulini ; in the first two the body is worm-like, in the last it is more or less flattened and fluke-like.

(*a*) In the Sebekini there is a lateral line (latero-ventral groove) on either side of the body, the hooks are arranged in a trapezoid, and the alimentary canal (which is plainly visible in a cleared specimen) is sinuous. In this section the following five genera are included by SAMBON :—

Sebekia, Sambon : worm-like species of small size (with one exception not more than an inch in length, and often smaller), characterized by their small hooks with the convexity *serrated* ; found in crocodiles, alligator, caiman and gharial.

Leiperia, Sambon : worm-like, with the posterior moiety of the body coiled in a spiral, of large size ; a single species, in the Nile crocodile.

Sambonia, Noc and Giglioli : in Varanid lizards. *Diesingia*, Sambon, in the Indian Kachuga (freshwater tortoise). *Alofia*, Giglioli : of which the unknown hosts are conjectured by SAMBON to be fishes.

(*b*) In the Porocephalini there is not a lateral line, the hooks are arranged in an open curve, and the alimentary canal is straight. The species included in this section are worm-like parasites of snakes, and the females attain a length of several inches ; SAMBON recognizes four genera, namely :—

Porocephalus, Humboldt : the hosts of the adults are American Crotalines, the boa constrictor, and certain African snakes ; the constrictions between the annuli are not, or only slightly, marked, and the posterior end of the body is almost bulbous.

Kiricephalus, Sambon : the snake hosts occur in the oriental region and in America ; the anterior end of the body is knobbed like a Kaffir "Kiri," the worm-like body has a spiral twist.

Waddycephalus, Sambon : one species, in Australian snakes ; the worm-like body tapers posteriorly, and the tip of the tail is bilobed.

Armillifer, Sambon: the snake hosts are oriental and African; the constrictions between the individual annuli are very strongly marked, giving the body a characteristically chain-like or moniliform appearance.

(*c*) In the Linguatulini the form of the body is more or less fluke-like or spatulate. This section is constituted of two genera, namely:—

Linguatula, Fröhlich: parasitic in many mammals, both wild and domestic, in all regions of the globe except Australia.

Subtriquetra, Sambon: body, though more or less elliptical and flattened ventrally, strongly convex dorsally; parasitic in caiman and Indian crocodile.

As SAMBON remarks, the taxonomic position of the entire group of Linguatulida was long a puzzle.

As a matter of fact their place in Nature was for about 50 years after their first discovery entirely misconceived. They were included among the intestinal worms; not because of their life-history, for that was unknown, but merely at first from their superficial appearance and endoparasitic habit.

The great landmark in the history of the group is the classical memoir of LEUCKART, who was the first to follow out experimentally the wonderful life-cycle—so much resembling that of a tapeworm—of a Linguatulid. This memoir, which is entitled "Bau und Entwickelungsgeschichte der Pentastomen," and was published at Leipzig and Heidelberg in 1860, contains *inter alia* a very complete account of the gradual elucidation of the nature and true relations of this aberrant group of parasites. It would take us too far from our general purpose to follow all the attractive details of LEUCKART's history, but a short summary of its leading events would, we think, be both interesting and in several ways instructive.

LEUCKART tells us that the endoparasites now known as Pentastomida (or Linguatulida) were first brought to notice in 1787 by an eminent French veterinarian named CHABERT. CHABERT discovered in the depths of the nasal cavities of dogs and horses a finger-length "worm," which he took for a tapeworm and called *Taenia lanceolata*.

Two years afterwards ABILGAARD in Denmark and FRÖHLICH in Germany encountered—the former in the body-cavity of a goat, the latter in the lung of a hare—a very much smaller "tapeworm" of the same sort. ABILGAARD called his *Taenia caprina*; FRÖHLICH regarded his as a new genus of Helminths, and named it *Linguatula serrata*. It is FRÖHLICH's name, but in more aristocratic zoological company, that the then misunderstood creature still bears.

Ten years later (1799) the famous HUMBOLDT, in the course of his travels in South America, came upon another puzzling "worm" in the lung of a rattlesnake. At first he classed it as an Echinorhynchus, then as a Distoma, and finally he conceived the new genus *Porocephalus* and named it *Porocephalus crotali*. In quite different zoological associations it is still known by that name.

In 1811 BOSC discovered a "worm" in the lung of a guinea-pig. Regarding it as a new genus and species (though really it was the form already named by FRÖHLICH) he called it *Tetragulus caviae*.

It needed what LEUCKART calls the wonderful RUDOLPHI touch to make out that all the afore-described "worms" formed a single zoological group. But even RUDOLPHI failed to locate the group; taking the mouth and the four hook-pockets for suckers, he eventually placed it, in 1819, under the generic name Pentastomum, among the many-suckered Flukes, between Tristomum and Polystomum.

The genus *Pentastomum* remained either among the Trematodes or among the Nematodes until 1831, when MEHLIS (whose work, unpublished, was made known by NORDMANN) recognized that it was something altogether remote from any of the intestinal worms. But neither MEHLIS nor NORDMANN understood the true relations of Pentastomum, and their immediate successors, who included such redoubtable authorities as OWEN and DIESING, could not get away from the idea that those relations were with the parasitic worms; the latter, in 1836, placing Pentastomum in a separate order, Acanthotheca, between the Nematodes and Trematodes.

In 1845 DUJARDIN drew attention to the fact that these Acanthotheca differed from every kind of parasitic worm, and approached the Arthropoda, in having striated muscles. And in 1849 the great VAN BENEDEN, on embryonic as on anatomical grounds, put Pentastomum (*i.e.*, the group Linguatulida) in its proper setting (though not in its exact rank) in the phylum Arthropoda.

It was about this time, LEUCKART tells us, that the Linguatulida became interesting as human parasites, and it was from this interest that their life-history seems to have been approached. About 1847 PRUNER had not infrequently observed, in Cairo, and particularly in negroes there, parasites, which he took for nematodes or for insect larvae, encysted in the liver. BILHARZ, however, recognized what they were, and VON SIEBOLD referred to them as a new species of Pentastomum. In 1854 ZENKER stated that a quite different species of Pentastomum was a common parasite of man—usually in the liver —nearer home.

That these human parasites were not sexually developed attracted the attention of more than one observer, and in 1854 GURLT formulated the hypothesis—in analogy with the life-history of some of the helminth parasites of man—that they were developmental stages of Pentastomum. In LEUCKART's memoir the experimental proof of this hypothesis is presented in original detail by LEUCKART himself.

It was LEUCKART, finally, who also traced the Linguatulidae (or, as he calls them, Pentastomidae) to their place in the natural system, as a family connected with the order of Mites (Acarina).

Since LEUCKART's time a good deal of study has been given to the Linguatulida, but the results have not, any more than the earlier work, received quite the attention they deserve in zoology text-books. One of the best, comparatively recent, accounts of the anatomy of the group for English readers is BALDWIN-SPENCER's "Anatomy of *Pentastomum teretiusculum*," in the *Quarterly Journal of Microscopical Science*—1890, Vol. 34, Part 1, pp. 1–73, with 8 plates. SAMBON's well-illustrated papers on classification, specific characters, geographical distribution, and specific host-incidences of the Linguatulida should now provide for the worker far afield the means of adding to our knowledge of a group that is not without importance in tropical pathology.

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TROPICAL DERMATOLOGY.

FUSCO (Pietro). **Considerazioni sulle malattie cutanee in Libia: Sifilide—Lepra—Pian.** [Skin Affections in Lybia: Syphilis—Leprosy—Yaws.]—*Arch. Ital. di Sci. Med. Colon.* Tripoli. 1922. Aug. Vol. 3. No. 8. pp. 165–173.

Cutaneous manifestations of syphilis are less often met with than one would expect seeing that, according to the author, the disease may be said to be practically universal among the Arabs. This fact is ascribed to the disease having prevailed for so long a period that a certain degree of immunity has become hereditarily transmitted, and the disease consequently of a mild type. The same is said to hold good as regards Leprosy, though all forms occur. Yaws was first recorded in 1912, and CASONI in 1915 reported ten cases collected in four years. It also is of a mild type.

H. Harold Scott.

CARRIÓN (Arturo L.). **Algunas observaciones sobre las dermatomicosis.** [Observations on the Dermatomycoses.]—*Bull. Porto Rico Med. Assoc.* 1922. Oct. 30. Vol. 16. No. 130. pp. 204–210. With 3 figs.

Accounts of three cases, a youth of 17, a man of 43, and a woman of 48 years, suffering from Tinea cruris. They are recorded because of the sites secondarily affected: the right side of the neck in the first, the abdomen, chest and shoulder in the second, the right side of the face and the right subclavicular region in the third.

H. H. S.

CARNEIRO (A. Lima). **Uma epidemia de tinha produzida pelo "*Trichophyton Crateriforme*," Sab. 1893.** [An Epidemic of Ringworm due to *Trichophyton crateriforme*, Sabouraud, 1893.]—Reprinted from *Med. Contemporanea.* 1922. No. 6. 6 pp. With 6 text figs.

Thirty-seven cases were observed in a school, 24 of the patients being under 16 years of age. They proved very resistant to treatment, icthyol, resorcin, iodine in alcohol, biniodide and bichloride of mercury all being ineffectual.

The organism was grown from four cases. It was an endothrix which the author terms *Trichophyton crateriforme*, Sabouraud, 1893, as "the name most used in medical mycology," but states that it is the same as *T. tonsurans* and *T. megalosporon* endothrix.

H. H. S.

OTA (M.). **Sur deux espèces nouvelles de Dermatophytes en Mandchourie: *Microsporum ferrugineum* et *Trichophyton pedis* n. sp.**—*Bull. Soc. Path. Exot.* 1922. July 12. Vol. 15. No. 7. pp. 588–596. With 4 text figs.

The first species here described seems to be the common form in schools in Moukden. Out of 40 pupils 14 were affected with this organism. It causes bald patches on the scalp, and circinate areas on the smooth skin, sometimes, but rarely, vesicular, mostly scaly. Mycelium is readily found in the hair shaft and in scales. Cultures on glucose agar and maltose agar give a rust-coloured downy growth.

Drop cultures show forms of growth very like *Microsporum Audouini*, and the parasite is probably a human variety.

The second fungus described produces a dysidrosis of the feet, and grows a culture white on the surface, but showing either a brownish tint or a purple colour when seen through the depth of the medium. The author discusses the question whether it should be regarded as trichophyton or epidermophyton, but as it can infect hair the term trichophyton is better.

E. G. Graham Little.

TERRA (Fernando), TORRES (Magarinos), DA FONSECA (O.), & ARÊA LEÃO (A. E.). **Novo typo de dermatite verrucosa, mycose por acrotheca, com associação de leishmaniosa.** [A New Type of Dermatitis verrucosa due to Acrotheca in Association with Leishmania.]—*Brazil Medico.* 1922. Dec. 9. Year 36. Vol. 2. No. 49. pp. 363–368. With 7 text figs.

The lesion described started as small nodules which broke down in the centre and ulcerated; tough scabs formed which in time became loosened and scarring occurred, but the disease in many places extended at the periphery. The majority of the patients were agricultural labourers, and the first site of the disease was usually the lower limb.

Details are given of a man, 80 years of age. In this case the disease began six years previously as a small nodule on the inner aspect of one heel. This ulcerated and extended over the foot and up the leg almost to the knee. The Wassermann reaction proved negative, but nevertheless the condition was treated as syphilitic with neosalvarsan, salvarsan, mercury injections, with tartar emetic locally and potassium iodide by mouth, without benefit. The fungus Acrotheca was obtained on culture. In contradistinction to the blastomycoses and sporotrichoses the lesions are limited to the skin and do not involve the deeper tissues. In this case sections stained by Giemsa revealed also the presence of *Leishmania tropica.*

The disease is very chronic, persisting for 8–10 years or more; it is painless, causes very little itching, and does not appear to affect the general health.

H. H. S.

SALVAT (P.) & FONTOYNONT (M.). **Contribution à l'étude des Mycoses malgaches. Abcès sous-dermiques dus à l'***Endomyces molardi* **(n. sp.).**—*Bull. Soc. Path. Exot.* 1922. May 10. Vol. 15. No. 5. pp. 311–320. With 20 text figs.

This is a case report of a new mycosis observed in a male native aged 26, who had contracted the disease on the East coast. The first lesion noted was a nodule on the inside of the leg, which ulcerated. Similar lesions with similar developments followed, so that the greater part of the left leg became occupied by a sheet of ulceration, with deep fistulae and small subcutaneous abscesses from which pus containing a fungus was obtained. Cultures were best grown on media such as carrot, and agar, treated with glycerine, but the variety of forms was best studied in liquid media. On glycerine agar the fungus forms white downy elevations which become crateriform and a deep yellow. Appearances on various media are described in detail. The morphology of the parasite is fully described and illustrated in a plate.

The authors emphasize the point that on Sabouraud lactose agar media the growth was least characteristic. The identification as an endomyces was complete, and the name Molardi is proposed. Inoculations into the skin of a guinea pig produced a subcutaneous abscess. Inoculation into the peritoneum of a guinea pig and a rabbit resulted in the death of both animals in 34 and 44 days respectively, and from the blood of the guinea pig a few parasites of the same type were recovered.

E. G. G. L.

FONTOYNONT & CAROUGEAU. **Étude sur le Hodi-potsy, dermatomycose malgache.**—*Bull. Soc. Path. Exot.* 1922. June 14. Vol. 15. No. 6. pp. 424–436. With 2 text figs.

Under the native name here given the authors describe a mycosis very common in Madagascar, first described by Jeanselme, with the title "achromie parasitaire de la tête et du cou à recrudescence estivale," a title which the authors suggest should be adopted as the official name. The eruption disappears in winter, recurs in summer, affects the sexes equally, is commonest in the fourth decade, is exceptional in children and old people, and unknown in babies. It is extremely contagious, affects especially the neck and face, is without subjective symptoms, or glandular enlargements. The condition is identified by the authors with tinea flava of CASTELLANI, who says that the fungus does not grow on culture media. The authors have, however, succeeded in growing it most successfully on Sabouraud's proof medium, both at room temperature and at 37°, but better under the first conditions, and without rubber tops on the tubes. The parasite was examined by LANGERON, who proposes the name "Hermodendron Fontoynonti." The disease was reproduced from a tube culture on a healthy native by inoculation.

E. G. G. L.

HAASE (Marcus), HALL (E. R.) & MARSHALL (C. H.). **Local Blastomycosis : Report of Case.**—*Jl. Amer. Med. Assoc.* 1922. Sept. 2. Vol. 79. No. 10. pp. 820–822. With 3 text figs.

The patient was a negro aged 78, and has been under the observation of Haase for a blastomycosis of the cheek and neck. He was treated with pot. iod. and had recurrences about the old site. Later he had a swelling of the left testicle, which was removed. The epidymis was found to be purulent and from the pus blastomyces was grown. Metastasis to the epidymis is apparently extremely rare.

E. G. G. L.

LANGERON (Maurice). **Sur un champignon d'une otomycose brésilienne : *Sterigmatocystis Hortai* n. sp.**—*Bull. Soc. Path. Exot.* 1922. June 14. Vol. 15. No. 6. pp. 383–384. With 1 text fig.

Langeron contributes a note on the identification of a fungus grown in pure culture by HORTA from the ear of a patient observed in Rio de Janeiro, with the auditory meatus blocked by a dry downy membrane, from which the fungus was obtained. The morphological characters are very fully described, and Langeron regards it as a new species, which he proposes to name as above.

E. G. G. L.

LANGERON (M.) & HORTA (P.). **Note complémentaire sur le** *Cladosporium Wernecki* **Horta, 1921.**—*Bull. Soc. Path. Exot.* 1922. June. Vol. 15. No. 6. pp. 381–383. With 1 text-fig.

The authors by further study of cultures derived from the case described by Horta [see this *Bulletin*, Vol. 19, p. 160] confirm the opinion then offered that the organism is a Cladosporium (*Wernecki.*).

E. G. G. L.

vi. JOUENNE. **Un cas de mycétome à grains rouges.**—*Bull. Soc. Méd.-Chirurg. française de l'Ouest-Africain.* 1920. June. Vol. 2. No. 6. pp. 172–173.

vii. HECKENROTH & NOGUE. **Nouvelle observation d'un mycétome à grains rouges et traitement par l'iodure de potassium des pieds de Madura.**—*Ibid.* Oct. No. 8. pp. 226–229.

iii. NOGUE. **Un cas de mycétome à grains rouges des régions sterno-costale et abdominale supérieure.**—*Ibid.* 1921. Vol. 3. Jan.–Feb. No. 11–12. pp. 14–15.

i. A case report of a male native, aged 40, in whom the disease began with an abscess on the sole of the right foot, on which a tumour developed and invaded the whole foot. Red grains were obtained from deeper parts of the swelling, but their cultivation failed. The patient improved with administration of pot. iod., but left the hospital before adequate treatment could be given.

ii. A report of two cases of mycetoma of the foot, both in native women, and in both the sole treatment given was the administration of iodide of potassium, with favourable result. In one case red grains were obtained in the discharge, in the other white grains. Mycelium was demonstrated in each case, but attempts at culture failed owing to contaminations.

iii. The patient was a male Senegalese native, aged 38. The anterior thoracic wall and upper part of the abdomen presented a diffuse infiltration, with numerous sinuses, in the pus of which red grains were abundant. Large doses of iodide of potassium resulted in the healing of all except one sinus, but the patient insisted on leaving at this stage.

E. G. G. L.

i. JOUENNE. **Un cas de mycétome à grains noirs.**—*Bull. Soc. Méd.-Chirurg. française de l'Ouest-Africain.* 1921. Jan.–Feb. Vol. 3. No. 11–12. pp. 16–21.

ii. ——. **Nouveau cas de mycétome à grains noirs.**—*Ibid.* Mar. No. 13. pp. 36–37.

iii. ——. **Observations de mycétome à grains noirs de la cuisse droite, de la hanche, et de la fesse droite, et de mycétome à grains rouges du pied. Constatations anatomo-pathologiques.**—*Ibid.* May. No. 15. pp. 76–82.

iv. —— **Un cas de mycétome à grains noirs kystique.**—*Ibid.* Nov.–Dec. No. 19. pp. 142–144.

LEGER. **Culture du Champignon.**—*Ibid.* pp. 144–146.

i. The patient, a male native, aged 45, gave a history of an excoriation of the leg by a tree-root, which was followed by an oedematous swelling of the part within 48 hours, and within 14 days showed characteristic sinuses and abscesses with a discharge of black grains,

mistaken by the patient for grains of gunpowder. Mycelium was demonstrated, and he was given iodide of potassium, which resulted in complete healing. The site began to discharge again after a time and he then sustained another accident to the same part which was followed by a swelling of the upper third of the leg, when he came under the care of the writer. Sinuses in the swollen area exuded pus filled with black grains, which the author compares to caviare.

A preliminary note from the Institute of Biology, to which the examination was submitted, states that the information already obtained allowed of the classification as a Madurella.

ii. The patient was a male native, whose father suffered from the same affection due to the same type of fungus. The patient apparently contracted the disease in the site of a sore produced by the extraction of a Guinea worm in the right foot. From sinuses in the foot black grains were obtained in large quantity. No further indication of the species is given.

iii. The patient was a native of Mauritania, who had travelled much, and the country of origin of his disease could not be ascertained. When seen he had a large scar from buttock to thigh, on the posterior aspect, and lesions, which were regarded as gummatous, and rupial ulcers on the anterior and inner aspects of the right thigh. The first diagnosis—tertiary syphilis—was changed to mycetoma on the observation of black grains in the discharge, which were submitted to the Institute of Biology for identification. The author conjectures that the mycetoma was a secondary infection of a syphilitic ulcer, but the patient died before a Wassermann test could be made. A sinus running from the iliac crest to the coccyx in the substance of the buttock was found to be filled with black grains.

A second case of mycetoma with red grains, in a native woman, is also recorded by the author—in this case the left foot being affected and presenting all the clinical signs of Madura foot. The normal tissues of the foot were found to be replaced by a grey substance resembling the grey matter of the brain, enclosed in a hard fibrous shell, and breaking through this shell in places. The red grains were found disseminated throughout the grey substance. The author contrasts the appearances of the black variety, producing little more than channels, like worm-holes in fruit, and the much more serious destruction caused by the red variety, and regards these cases as typical of the action of the two infections.

iv. The patient, a male native, showed a cystic tumour the size of an orange behind and below the internal malleolus of the right foot, and an oval scar covered with dry scabs, on the sole of the same foot. From this site, the patient said, discharge took place from time to time, containing "small pieces of coal." The disease had first showed itself in the Cameroons. The cyst was enucleated without difficulty and found to be full of typical black grains. Some of these were investigated by Leger, who contributes the second part of the memoir, and pure cultures were grown on Sabouraud media at room temperature. The first colonies were a greyish white, with eccentric increase, the middle of the growth being at first raised, later crateriform. Still later there appeared round this crater a border of little black heads.

Detailed examination of cultural characteristics allowed of the identification of the organism with "*Madurella Mycetomi*, Laveran, 1902."

E. G. G. L.

i. Bonrepeaux. **Un cas de mycétome à grains noirs.**—*Bull. Soc. Méd.-Chirurg. française de l'Ouest-Africain.* 1921. Apr. Vol. 3. No. 14. pp. 57–59.

ii. Lhuerre. **Un cas de mycétome à grains noirs.**—*Ibid.* May. No. 15. pp. 84–85.

i. The patient was a man, aged 26. The initial injury was an excoriation of the knee from a shrub six years previously. In the site of this accident there was a phagedenic ulcer from which filarial organisms could be demonstrated. Later from the same part of the swollen leg mycetomatous elements with black grains were obtained. The author discusses the possibilities of an accidental coincidence or a causative connection between the filarial infection and the mycetoma, and thinks that the former infection prepared the way for the latter.

ii. The patient was a male native who had sustained some injury to the thenar eminence, which he treated with the application of "leaves" (nature unknown). The thumb swelled rapidly, and numerous sinuses developed in the swelling, from which black grains could be pressed. Six intravenous doses from 15 to 90 cgm. of novarsenobenzol at intervals averaging a week resulted in complete cure of the condition.

E. G. G. L.

Raynaud (M.), Montpellier (J.) & Lacroix (A.). **Un cas de mycétome du pied à *Nocardia madurae*, chez un indigène algérien.**—*Bull. Soc. Path. Exot.* 1922. June 14. Vol. 15. No. 6. pp. 379–381.

The patient was a native, aged 71, with a swelling of the right foot at first taken to be tuberculous. White grains were found in the pus derived from deep-seated abscesses in the foot. Cultures were obtained on Sabouraud media, and identified as *Nocardia madurae.*

E. G. G. L.

Dyke (H. W.) & Macfarlane (N. M.). **A Case of Madura Foot.**—*S. African Med. Rec.* 1922. July 22. Vol. 20. No. 14. pp. 270–271. With 1 text fig.

The patient was a male native aged 30, who contracted the disease in Zululand. The whole right foot was affected up to the ankle, and it was consequently amputated. "Mycelium" was demonstrated from the sinuses on the foot but no further identification of the organism present was attempted.

E. G. G. L.

Cornwall (J. W.) & Lafrenais (H. M.). **A New Variety of Streptothrix cultivated from Mycetoma of the Leg.**—*Indian Jl. Med. Res.* 1922. July. Vol. 10. No. 1. pp. 239–248.

Material for culture was obtained from a deep sinus in a tumour occupying the middle third of the leg of a Hindu cultivator aged 55. Aerobic culture succeeded best, but the organism could be grown anaerobically; the best medium was glucose agar and the optimum temperature 37°. Morphologically, the organisms "did not differ materially from the appearances which have often been described and illustrated," but the fact that it was "acid fast" and "alcohol fast" differentiates it from other varieties of *Streptothrix madurae.*

E. G. G. L.

RIDLEY (H. N.). **Plant Dermatitis.**—*Jl. Trop. Med. & Hyg.* 1922. July 15. Vol. 25. No. 14. pp. 225–227. With 1 text fig.

Ridley calls attention to the poisonous properties of the Order *Anacardiaceae* and especially of the genera *Gluta* and *Melanorrhoea*, known under the popular name "Rengas" in Malaya. He suggests that perspiration may play a part in the production of dermatitis, those who sweat most being most affected. Alkalies seem to neutralize the poison, and alkaline compresses are recommended in treatment of the dermatitis.

E. G. G. L.

ONORATO (R.). **Il fagedenismo in Tripolitania.** [Phagedaena in Tripoli.]—*Arch. Ital. Sci. Med. Colon.* Tripoli. 1920. Jan., Feb., Mar., Apr. and May. Vol. 1. Nos. 1, 2, 3, 4 and 5. pp. 33–49. With 5 text figs. and 9 diagrams; 83–102. With 10 text figs.; 107–143. With 1 text fig.; 155–196; 199–264.

These observations are based on experience in the Tripoli civil hospital between August, 1912, and July, 1919. Professor Onorato makes full use, however, of the literature, and the result is a very full and interesting description of phagedaena. A number of tables are printed in support of the contention that it is becoming less common as a result of the introduction of Italian civilization. The high incidence in August and September is attributed to the two factors of drought and heat. All ages are found to be liable to infection, but the following figures show that the industrial period of life is the most dangerous.

Ages.	*Average yearly incidence for period* 1912–19.	*Ages.*	*Average yearly incidence for period* 1912–19.
0–5	1·3	45–50	3·0
5–10	3·0	50–55	2·0
10–15	5·3	55–60	2·0
15–20	8·4	60–65	1·4
20–25	6·1	65–70	1·4
25–30	7·0	70–75	0·4
30–35	6·0	75–80	—
35–40	6·0	80–85	0·1
40–45	3·6		

The liability to trauma and to infection are regarded as factors of primary importance. Sex and nationality show variations only because of the variations in occupation to which they correspond. Thus women, as has frequently been observed, are less subject than men. Onorato points out that the Arab women who are especially tied to their homes are the least subject of all women. Any pre-existing lesion, such as those of syphilis and tuberculosis or the scarification made in vaccination, are liable to become phagedenic.

Numerous organisms are described as being found regularly in the ulcers; in the superficial strata thereof many cocci and bacilli; in the middle strata, more abundant bacilli and a few spirochaetes; in the deeper layers the spirochaetes are rather more numerous. Le Dantec's bacillus and Vincent's spirochaete are described as the specific infective agents. Professor Onorato is convinced that these organisms exist in a true symbiosis and are not different forms of a single micro-organism. He draws attention especially to the fact that whereas Le Dantec's bacillus divides transversely, the spirochaete

divides longitudinally (not transversely as WECHSELMANN has stated). These symbiotic agents may be capable of causing ulceration each in the absence of the other, but their association renders them especially virulent. The function of the spirochaete is to penetrate from cell to cell, causing the death of the tissue by its toxins. The more active the lesion the greater is the number of spirochaetes found in the deeper tissues. The appearance of pyogenic cocci is invariably the result of secondary infection. The spiro-bacillary symbiosis is responsible not only for phagedenic ulcer in tropical areas but also for the following diseases arranged in order of importance :—Vincent's angina, ulcero-gangrenous stomatitis, noma, spontaneous gangrene of the genital organs. In tropical regions the infection is endemic. Various experiments with the specific agents both in animals and man have been made by the writer and confirm the importance of the symbiosis. Naturally the experimental infection in man was not allowed to proceed far lest it should reach a stage beyond control, and for the same reason no experiments were undertaken on human mucosa. Prophylaxis consists in oral and general hygiene and isolation of the sick. In treatment local application of iodoform is most effective while injections of arsenobenzol are indicated in all forms of the disease. Records of cases treated and a useful bibliography complete the article.

J. Rosslyn Earp.

SEN (K. C.). **Observations on "Ulcus tropicum" in North Palestine.** —*Indian Med. Gaz.* 1922. Aug. Vol. 57. No. 8. pp. 286–289. With 1 plate.

This paper is based on a study of 21 cases ; the legs, ankles or feet were the sites affected, and the time was limited to the months August-October. Experiments to inoculate the healthy skin failed, as well as hypodermic inoculation of the discharge. Spirochaetes and the fusiform bacillus were found in all the sores ; in a few cases streptococci, scanty in number, were obtained. The most satisfactory treatment was found to be by irrigation with warm saline ; a ligature is then put on the leg 4 in. above the ulcer ; the latter is touched with pure hydr. perchlor., and after one minute again washed with saline and the ligature removed and normal saline dressings applied three times a day thereafter.

E. G. G. L.

BEURNIER. **Traitement de l'ulcère phagédénique des pays chauds par leur exposition aux rayons solaires.**—*Bull. Soc. Méd.-Chirurg. française de l'Ouest-Africain.* 1920. Nov. Vol. 2. No. 9. pp. 259-262.

The method of treatment is thus described. The ulcer was cleaned up with cotton wool soaked in weak solution of pot. permanganate, and exposed to direct sunlight for periods gradually augmented from 20 minutes to three hours. After exposure the part was dressed with Reclus's ointment, or painted with antiseptic lotions, or dusted with Vincent's powder. The author gives preference to the latter, but emphasizes his belief that the good results he obtained must be attributed to the sunlight rather than to the dressing. When ulcers fail to heal under this treatment the author suggests that syphilis should be suspected as an additional factor.

E. G. G. L.

BAUVALLET. **A propos du traitement de l'ulcère phagédénique.**—*Bull. Soc. Méd.-Chirurg. française de l' Ouest-Africain.* 1920. Oct. Vol. 2. No. 8. pp. 219–224.

Bauvallet recommends in preference to all other methods of treatment the complete surgical ablation of the ulcer, this method being available only in superficial ulcers, but their size is no objection. Minute details are given of the surgical technique employed. The most rigid asepsis is demanded. The tissues are removed down to the surface of muscle, and complete haemostasis must be secured by ligature and tampons. Dry dressings are applied.

In cases where for any reason operation is impossible, the author describes another procedure. The wound is painted with solution of silver nitrate, 1/10 to 1/20, and then a zinc electrode attached to a Leclanché battery is passed over the surface. The result is to produce double nitrate of zinc and silver, which acts as a caustic. The wound is exposed to the sunlight to dry for a few minutes, or, preferably, dried quickly with a hot air douche, and the following zinc paste applied all over the site with a spatula:—Zinc oxide, talc, sterile oil, equal parts. No dressings are used. The procedure may have to be repeated.

E. G. G. L.

VAN NITSEN (R.) & WALRAVENS (P.). **La vaccinothérapie dans les ulcères tropicaux.**—*Ann. Soc. Belge de Méd. Trop.* Brussels. 1922. Vol. 2. No. 1. pp. 111–112.

The authors succeeded in obtaining cultures of the fusiform bacillus, which is a strict anaerobe, on sterile ascitic fluid covered with a layer of sterile paraffin. The growth contained an abundance of the associated bacteria, the fusiform bacillus and the spirillum. Emulsions of the associated bacteria were sterilized, and a vaccine prepared which had the following composition per cc.: fusiform bacillus, 80 millions; spirillum, 120 mill.; diplococcus, 300 mill.; staphylococcus, 300 mill.; streptococcus, 200 mill. Doses of $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 cc. were given at intervals of two days. Some 200 patients were tested in this way, but the authors found no improvement with the treatment and pronounce it of no curative value.

E. G. G. L.

RAYNAUD (M.), MONTPELLIER (J.) & LACROIX (A.). **Phagédénisme chronique serpigineux de l'aine (ulcère serpigineux vénérien).**—*Bull. Soc. Path. Exot.* 1922. July 12. Vol. 15. No. 7. pp. 641–646. With 3 text figs.

This is a case report of a venereal ulcer in a man aged 43. The first lesion noted was a soft sore which appeared on the prepuce two days after coitus, and suppuration of the inguinal gland followed. Three months later on the skin over the anterior superior iliac spine on the left side a "pimple" showed which became the starting point of a large ulceration. Wassermann reaction was reported as "4 plus." Repeated treatment with injections of "914" produced no clinical improvement. Many attempts to find Ducrey's bacillus in smears failed entirely. Cultures (anaerobic as well as aerobic) on various media, including Sabouraud's, gave a few colonies of *Staph. albus* only. An entirely similar lesion clinically was produced by inoculation of fragments hypodermically into a healthy man, and the resulting ulcer was removed surgically and did not recur.

E. G. G. L.

BROWN (David M.). **Serum in the Treatment of Veldt Sores.** [Correspondence.]—*Brit. Med. Jl.* 1922. Aug. 5. pp. 236–237.

A medical man suffered from extensive and chronic veldt sores on the buttocks, which resisted all treatment. Brown injected 4,000 units of antidiphtheritic serum supplied by MERCK at least seven years previously. Improvement commenced within three days and the sores had entirely healed within 14 days [see this *Bulletin*, Vol. 16, p. 153].

E. G. G. L.

ONORATO (Raffaele). **Il granuloma ulceroso delle pudende in Tripolitania.** [Ulcerating Granuloma of the Pudenda in Tripoli.]—*Arch. Ital. Sci. Med. Colon.* Tripoli. 1921. Mar.–Apr., May–June, July–Aug.–Sept., Oct.–Nov.–Dec. Vol. 2. Nos. 3–4, 5–6, 7–8–9 & 10–11–12. pp. 58–64. With 1 text fig.; 68–96. With 1 text fig.; 110–127 & 129–137.

In the years 1912–20 the writer has treated a large number of cases of granuloma inguinale. The paper is based, however, on 31 cases which have been under close and systematic observation in the Tripoli hospital, of which he is the senior surgeon. These observations and a large number of laboratory experiments have resulted in a very complete and interesting description of the disease. The original contribution consists chiefly in work on the specific cause. Among a large number of bacteria found in the lesions, Professor Onorato inculpates certainly the *Calymmatobacterium granulomatis*, which he found almost constantly present. He thinks it probable, however, that this organism may not be the only one capable of producing the granuloma, and is strongly inclined to consider a spirochaete, which he describes and which differs from *S. pertenuis* only by the absence of chromatin granules and by its constantly pointed extremities as the specific cause in a certain number of cases (10 out of the 31 in this series). Laboratory experiments on guinea-pigs, rabbits and dogs proved both these organisms and especially *C. granulomatis* to be pathogenic, but Prof. Onorato was unable to reproduce the granulomatous lesion either in animals or in man.

Prophylaxis consisted in general and local hygiene. Treatment is varied. Whenever complete extirpation is possible by surgical intervention this should be carried out. In other cases X-rays or radium may be effective. In cases of spirochaete origin 2–6 injections of arsenobenzol will effect a cure. When the infection is due to *C. granulomatis*, treatment consists in 8–11 intravenous injections of 100 cc. of solution 1/1000 tartar emetic in normal saline, X-rays being used as adjuvant treatment.

J. Rosslyn Earp.

BEESON (B. Barker). **Granuloma Inguinale with Lesion on the Lower Lip. Report of a Case.**—*Arch. Dermat. & Syph.* 1922. Sept. Vol. 6. No. 3. p. 343. With 1 fig.

A case report in a male negro, who first developed ulcer of the groin and later on ulcer of the lip, from both of which sites the characteristic organisms were obtained. The patient was cured by intravenous injection of tartar emetic.

E. G. G. L.

GOODMAN (Herman). **Ulcerating Granuloma (Granuloma Inguinale).** —*Jl. Amer. Med. Assoc.* 1922. Sept. 2. Vol. 79. No. 10. pp. 815–819. With 5 text figs.

The author describes eight cases seen by him, typical in every way of the disease as seen in the tropics. Only in the first of these cases *Spirochaeta aboriginalis* was found, but not *Calymmatobacterium granulomatis*. In all the other cases the latter organism was demonstrated.

The author has seen several cases in New York City, which are lightly touched on without detail, but one case is more particularly described, as it presented a lesion of the tongue. The patient was probably syphilitic as well. Treatment with tartar emetic injections gave uniformly good results.

E. G. G. L.

MORALES MACEDO (Carlos). **El primer caso de granuloma venéreo observado en el Perú.**—*Cronica Méd.* 1922. June. Vol. 39. No. 708. pp. 201–208.

This is believed to be the first recorded instance of granuloma venereum in Peru. The case, a Peruvian, 28 years of age, was sent to hospital with a diagnosis of "Cancer of the Pubis." The condition seems to have started spontaneously; there was no history of trauma, which some believe to be the invariable forerunner. A small papule was first noticed and in six months the disease had extended over the whole of the suprapubic region, the left groin, the inguino-scrotal fold, round the anus and on to the gluteal area. There was no involvement of lymphatic glands. The Wassermann reaction was negative and the blood condition generally within the limits of the normal. *Calymmatobacterium granulomatis* was seen in smears from the surface and deeper parts mixed with staphylo- and streptococci and treponemata.

Tartar emetic in 1 per cent. solution was injected intravenously every two or three days, the dose being increased from 2 to 12 cc. At the time of reporting twenty injections had been given [the total quantity of antimony tartrate is not stated] and the ulcer had been reduced to half the size it presented on admission. Locally, the only treatment was a simple boric acid dressing.

H. H. S.

LYNCH (Kenneth M.). **Tartar Emetic in the Treatment of Granuloma Inguinale and other Granulomata and Granulating Ulcers.**—*Southern Med. Jl.* 1922. Sept. Vol. 15. No. 9. pp. 688–692. With 4 text figs.

Two case reports are submitted, one of a negress with a very extensive granuloma occupying the anus, perineum and lower abdomen. Thirty injections of tartar emetic (2·72 gm. of the drug) were required to produce cure. In the second case there was concomitant syphilis and gonorrhoea, and the tartar emetic injections were given alternately with injections of arsphenamine. She was regarded as cured after twelve injections of antimony and three injections of arsphenamine. Three cases of ulceration of unknown causation were treated with tartar emetic injections with success.

E. G. G. L.

CLAASSEN (H. L.). [**Granuloma Inguinale.**]—*Ohio State Med. Jl.* Columbus. 1922. Oct. Vol. 18. No. 10. p. 685. [Summarized in *Jl. Amer. Med. Assoc.* 1922. Nov. 4. Vol. 79. No. 19. p. 1639.]

The author describes four cases in persons who had never been to the tropics. Donovan bodies were not constantly present.

E. G. G. L.

i. NOGUE. **Malades ayant eu des nodosités juxta-articulaires disparues à la suite d'un traitement par le novarsénobenzol.**—*Bull. Soc. Med.-Chirurg. française de l' Ouest-Africain.* 1921. Mar. Vol. 3. No. 13. pp. 35–36.

ii. —— **Malade atteint de nodosités juxta-articulaires et non guéri par l'arsénobenzol.**—*Bull. Soc. Path. Exot.* 1922. June 14. Vol. 15. No. 6. p. 488.

i. The patient, a male native aged 40, was admitted to hospital for pulmonary tuberculosis, and was found to have nodosities over each olecranon, and on the ninth right rib. The tumours were painless swellings, of the consistence of cartilage, and apparently adherent to periosteum. There were scars on the penis which suggested a previous syphilis. After five graduated injections of novarsenobenzol, one tumour had disappeared entirely and the other two diminished to vanishing point. The author cites another personal case, in a native woman, with nodosities about the elbows, and a history of her mother and grandmother having had similar tumours. No other investigations seem to have been made.

ii. The patient, a male native, received seven injections of novarsenobenzol increased from 15 to 90 cgm., combined with administration of pot. iod. by the mouth, without appreciable diminution of the nodules which covered the elbows and knees.

E. G. G. L.

DE QUERVAIN (F.). **A propos des nodosités juxta-articulaires.**—*Gaz. des Hôpit.* 1922. Aug. 8 & 10. Vol. 95. No. 62. p. 997.

This is a short note emphasizing the author's priority for the observation of the syphilitic causation of juxta-articular nodules, and explaining the differences in histological findings of different authors by the suggestion that the histology varies with the age of the nodule.

E. G. G. L.

VAN DIJKE (M. J.) & OUDENDAL (A. J. F.). **Voorkomen, bouw en oorzaak der Nodosités juxta-articulaires (van Jeanselme) bij Inlanders.** [Occurrence, Structure and Cause of Jeanselme's Nodosités juxta-articulaires in Natives.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1922. Vol. 62. No. 4. pp. 413–440. With 3 black and 7 coloured plates.

After reviewing the literature on their subject, the authors quote their findings in 36 cases, 32 of which showed signs of yaws and 1 of syphilis, whilst 2 admitted to have been suffering from yaws before. They had no opportunity of testing the influence of salvarsan, but they obtained 11 nodules from 10 patients for examination. A minute anatomical description is given with good illustrations, inducing the authors to classify the nodules as infectious granulation tumours.

Using Levaditi's silver impregnation method, the authors succeeded invariably in showing the presence of spirochaetes in the pathological tissue. Animal experiments are still necessary to obtain certainty whether these spirochaetes are those of syphilis or yaws.

W. J. Bais.

ONORATO (Raffaele). **L'ainhum.**—*Arch. Ital. Sci. Med. Colon.* Tripoli. 1920. June. Vol. 1. No. 6. pp. 268–297. With 1 plate.

The pathology of ainhum is discussed both from observation and from the literature, and also the differential diagnosis. Two of the three cases reported by the writer are of interest, the first because it occurred in a female Arab of white race, and the second because it involved the loss of all the toes of both feet. Although the second case was not seen until all the toes had either fallen off or been amputated by the patient, the writer is persuaded by the history and by a careful exclusion of other possibilities, *e.g.*, leprosy or syphilis, that this was a genuine case of ainhum. He claims that it is the first reported case in which all toes have been lost from this disease.

The anatomical changes found in the affected digit may be ascribed entirely, the writer believes, to a fibro-lipomatosis resulting from an absence of blood supply due to an irregular proliferative process which commences in the Malpighian layer of the skin. The various descriptions of the morbid anatomy of ainhum found in the literature simply represent different stages in this process. Of the various aetiological theories he favours that which considers chronic irritation as the cause and points out that where several members of a family have been attacked this may be due rather to common habits than to heredity or infection. He considers that the onward march of civilization will result in the disappearance of the disease, but to attempt at present to persuade natives to wear shoes would be a waste of time.

J. Rosslyn Earp.

HUDÉLLET (G.). **Lésions osseuses dans l'aïnhum.**—*Bull. Soc. Path. Exot.* 1922. May 10. Vol. 15. No. 5. pp. 350–352. With 1 text fig.

An excellent X-ray photograph is reproduced of the appearance of the fifth toe on the right foot, nearly separated from the foot by the disease, and shows a condensing as distinguished from a rarefying osteitis.

E. G. G. L.

VIEIRA (João Paulo Botelho). **Pemphigus tropical. Ensaio therapeutico pelo oleo de choolmoogra. Nota prévia.** [Tropical Pemphigus treated with Chaulmoogra Oil. Preliminary Note.]—*Brazil Medico.* 1922. Mar. 11. Year 36. Vol. 1. No. 10. pp. 117–118.

An account of two cases of "tropical pemphigus" successfully treated by injections of chaulmoogra oil after the failure of other methods. Both patients were women. One required 60 intramuscular injections, the other 45. Dose not given in either case.

F. S. Arnold.

NICOLLE (C.). **Sur trois nouveaux cas de** *Xeroderma pigmentosum* **observés en Tunisie.**—*Arch. Insts. Pasteur de l'Afrique du Nord.* 1922. June. Vol. 2. No. 2. pp. 240–241. With 1 plate.

——. **Complément de la VIe observation tunisienne et XIe cas.**—*Ibid.* pp. 241–242.

CUÉNOD & SOLOVIEF (P.). **XIIe cas de** *Xeroderma pigmentosum* **observé en Tunisie.**—*Ibid.* pp. 242–244. With 1 photograph and 2 figs.

JAMIN & CUÉNOD. **XIIIe cas de** *Xeroderma pigmentosum* **observé en Tunisie.**—*Ibid.* pp. 245–247.

These papers describe three new cases, which brings the number of examples of the disease reported in Tunis to 13, 11 of which were indigenous. The first of the new cases (No. 11 in the list) was a brother, aged 5 years, of No. 6, previously described and now re-observed. The second was a little girl with characteristic lesions about the eyes and on the face and arms. Sections of the skin showed the typical histology. The third case, a girl of 5, first showed the disease, at the age of 3, on the limbs and face, the eyes also being affected and the scalp.

E. G. G. L.

GOUGEROT (H.). **Prophylaxie des cancers cutanés. Radiolucites chroniques sur terrains radiosensibles et xeroderma pigmentosum.** —*Rev. pratique des Maladies des Pays Chauds.* Paris. 1922. Oct. Vol. 1. No. 1. pp. 34–52. With 1 plate.

Gougerot in this interesting paper states certain propositions which his great authority compels one to examine carefully, but which are not altogether in accordance with English experience. Thus he says that Xeroderma pigmentosum is "frequent," but he would seem to widen the category to include adult and senile epitheliomata ascribable to light, and he suggests that X-ray burns are of the same order and that the solar ray "must have elements analogous to X-rays." But a special fragility of the skin is to be assumed to explain this particular vulnerability, and hereditary syphilis is "to be suspected" as the underlying cause. The author then discusses at length the particular elements in the solar ray which may be responsible for the injury, and claims to be able to exclude the light rays, heat rays, and ultra-violet rays, and believes that the harmful rays are most probably the rays with short waves, situated just beyond the ultra-violet. The special fragility of the skin is analysed into two factors, (1) precocious senility, and (2) a naevoid degeneration of the skin, and the latter factor the author regards, with GAUCHER, as pre-eminently a syphilitic manifestation. Antisyphilitic treatment is to be tried, therefore, in Xeroderma pigmentosum, as well as protective measures against sun-light.

E. G. G. L.

PAWLOWSKY (E.) & STEIN (A.). **Des causes de l'apparition des taches bleues chez l'homme.**—*Bull. Soc. Path. Exot.* 1922. July 12. Vol. 15. No. 7. pp. 558–560.

The authors injected an emulsion of the salivary glands of *Phthirius pubis* into a human subject and produced the blue stains characteristic of the bite of the parasite. Extract of the stomach of the parasite had no such effect.

E. G. G. L.

MALARIA.

i. SPENCER (H. A.). **Malaria as it occurs upon the Middelveld of the Transvaal.**—*S. African Med. Rec.* 1922. Sept. 23. Vol. 20. No. 18. pp. 342–349.

ii. ——. **Malaria on the Lowveld.**—*Ibid.* 1923. Jan. 13. Vol. 21. No. 1. pp. 3–7.

i. On the middleveld, at altitudes of from 4,000 to 6,000 ft., malaria is rife but unrecognized, showing itself clinically as chronic rheumatism, bronchitis, chronic headaches, abortion. The evidence offered is partly direct (the detection of plasmodia in the blood), partly clinical (the association of these symptoms with the more classic signs of malaria), partly therapeutic (the clearing up of these ills under quinine, with or without arsenic). If this interesting paper stimulate local inquiry to check these symptoms case by case with microscopic findings it will produce valuable results. The statement that malaria can be acquired in the Himalayas at 12,000 ft. must be questioned. About half that altitude may be accepted in practice as the safety line.

ii. The riverine plains and valleys, cut out by erosion from the middleveld, which rises abruptly from them, show such pictures as this. Ten years ago, a settlement with canals and water-furrows, a veritable garden of greenness, hills and valleys for miles around smiling with crops, summer and winter; the appearance of epidemic malaria; the houses measured for screening; an estimate obtained working out at a few pounds a house; nothing done. At the present time: in winter not a crop to be seen; in summer some to be found if the search be sufficiently enduring; last winter three deaths in three days in a household of five persons, a typical instance; an epidemic mortality of 15 per cent. Little wonder that those who have had to live on the middleveld on duty look back on their experiences with horror. And the ghastly details of the picture avoidable.

[When one considers the climatic conditions—deep, humid, stagnant valleys, with heat, tropical in summer, soft and spring-like in winter, the syringa blooming the year round—one cannot wonder that malaria is rife. But one cannot but be amazed that, on the basis of diagnostic technique entirely inadequate, it should be definitely stated (the author is not concerned positively or negatively in this statement) that, though one may search the whole world and find, under similar conditions, ankylostomes everywhere else taking their inevitable toll of life, health and happiness, yet here we have the great exception; that here alone are these pests absolved from all place and share in this appalling mass of misery.]

Clayton Lane.

LEGER (M.) & BAURY (A.). **Index endémique du paludisme au Sénégal durant la saison sèche.**—*Bull. Soc. Path. Exot.* 1922. Oct. 11. Vol. 15. No. 8. pp. 766–770.

The figures here given have this general interest, that they indicate no parallelism between the parasitic and splenic indices. For instance, at Sor the first is 35 and the second 4, whereas in Khombole they are respectively 3 and 27. Of 91 children at Dakar, 57 were infected, 27 with *Plasmodium praecox*, 21 with *P. malariae*, and 4 with *P. vivax*.

C. L.

LEGER (Marcel), BÉDIER (E.) & BAURY (A.). **Dakar et ses environs : index du Paludisme aux diverses saisons.**—*Bull. Soc. Path. Exot.* 1922. Dec. 13. Vol. 15. No. 10. pp. 1006–1010.

The seasonal variation in the amount and kind of malaria in over 500 children and in 62 adults varied from 64 per cent. upwards in the former and stood at 33·8 per cent. in the latter. The subtertian parasite was the commonest, 56·5 to 67 per cent. ; the quartan next, 35 to 42·6 per cent. ; while the tertian had a maximum, between 5 and 10 years of age, of 0·9 per cent.

C. L.

GAMBIER (A.). **Index endémique paludéen de la ville de Bamako (Soudan Français).**—*Bull. Soc. Path. Exot.* 1922. Dec. 13. Vol. 15. No. 10. pp. 933–935.

Of 265 children examined, 203 showed malarial parasites, presumably in thin films, the monthly percentages from May to September being 60, 67·5, 84·5, 88·8, 85·5. Of the 202 cases 3 showed *Plasmodium malariae*, 1 *P. vivax*, 2 crescents, and the rest schizonts of *P. praecox*. In 1914 LEGER found that in the wet season 60 per cent., and in the dry one 50 per cent., were infected with *P. malariae*. SEGUIN confirms the present predominance of *P. praecox*.

C. L.

STRICKLAND (C.). **A Malaria Survey of Sawantwadi State.**—*Indian Med. Gaz.* 1923. Jan. Vol. 58. No. 1. pp. 7–15. With 1 map.

This full and scientifically conducted investigation must be directly consulted if the most is to be extracted from it. It shows that, contrary to the local belief, malaria is indigenous. The malarial foci lie in the foothills, the lower undulating country being relatively free. Of the many Anopheles found, the one bad carrier was *A. maculatus*, discovered in all ravines flowing down from the hills, and it is concluded—making due allowance for the fact that paddy cultivation was not going on at the time of the investigation, and that a relatively unfavourable insect host in swarms may do as much damage to man as an optimum one in lesser quantity—that *A. maculatus* was the main vehicle of infection in man. Since it is a jungle hater, the advised remedy is the encouragement of a narrow strip of jungle along the ravine banks. Considerable stress is laid upon the importance of encouraging small fish in wells and paddy fields and the exclusion of larger and fish-eating species. The uncommon enterprise of the Sardesi Maharaj deserves success.

C. L.

UKIL (A.). **Observations sur le paludisme pernicieux et la fièvre bilieuse hémoglobinurique au Bengale (Indes anglaises).**—*Bull. Soc. Path. Exot.* 1922. Dec. 13. Vol. 15. No. 10. pp. 962–970.

The Professor of Pathology in the high-sounding " National Institute of Medicine, Calcutta," has seen 200 cases of malaria with grave cerebral or abdominal complications, four of them with haemoglobinuria. In some of these cases—the text does not supply the number, diagnosis is therapeutic—they have recovered after quinine. The symptoms are as usual. The prognosis is considered good if treatment be instituted early, to effect which no new considerations are advanced.

All the haemoglobinuric cases came on after dosage with 15 gr. of quinine daily. In three, young forms, and in one, gametocytes, of the subtertian parasite were found.

C. L.

VAN LAAREN (G. F.). **Magelang geen malaria-vrije plaats.** [Magelang (Java) not a Malaria-free Locality.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1922. Vol. 62. No. 1. pp. 27–29.

Magelang has been hitherto considered as free from malaria, and accordingly indicated as a health resort for malaria patients. Van Laaren quotes authors who assert the contrary, and mentions a few facts to confirm them. Among 2,678 school children (5–16 years), 331 had enlarged spleen, and of these 61 parasites in the blood. Of the Anopheline mosquitoes caught a high percentage was *Anopheles aconitus*, well-known as a malaria-transmitting species.

W. J. Bais.

GIBSON (C. C. G.). **Malaria and Mosquitoes in Belize, British Honduras.** —*Jl. Roy. Army Med. Corps.* 1923. Jan. Vol. 40. No. 1, pp. 38–43.

In a military area, vacant since 1886, bounded on the north and east by the sea, on the south by the city of Belize, and on the west by a swamp, were quartered 250 men of the Royal Sussex Regiment, from December 1919 to July 1920. The barracks had gauze-fitted doors and windows, but their warped, ill-fitted woodwork made them merely insect traps. Latrines are situated over the sea 20 yards from the shore, and, in spite of the praiseworthy efforts of numerous catfish, the muddy bottom for a mile out to sea is so contaminated that the water is unfit for ablution. Water for all purposes is limited to that which can be collected from roofs and stored. If the usual eighteen-mile sea breeze blow, life is endurable, and a mosquito net can be dispensed with. If the wind drop the sweat-soaked men either try to endure life in a muslin net, for ordinary mosquito netting is useless against the persecuting sandfly, or they seek to escape from these pests by flight to the bathing shed, built over the sea, as are the latrines, where they could often be seen crying in their misery. Anopheles bred over the whole military area in pools in the grass, in landcrab holes, in tree stumps and boles. Small wonder that in seven months this regiment had a malarial incidence of 57·2, whilst the 1st West India Regiment, which followed them, went one better with 84·8 per cent. One is left guessing regarding the nature of the military urgency which necessitated the infliction of all this misery and incapacity.

C. L.

ORTICONI (A.). **Les ravages du paludisme en Corse.**—*Bull. Soc. Path. Exot.* 1922. Oct. 11. Vol. 15. No. 8. pp. 683–686.

This *Bulletin* has recently illustrated again and again the great interest and importance which the members of the Société de Pathologie Exotique attach to the question of malaria in Corsica, and the apathy which they attribute to the central Government in respect to it.

C. L.

FABBRI (G.). **La malaria nella questione meridionale.**—*Ann. d' Igiene.* (Supplement.) 1922. Vol. 32. 62 pp.

The "Questione Meridionale" is fundamentally agrarian in nature, but inextricably mixed up with difficulties technical, economic, juridical and quasi-political. This essay is ostensibly concerned with the manner in which malaria is wrapped up in the question, in that it "constitutes the first and greatest obstacle to the solution of the whole southern problem."

The author shows that from the time of the promulgations in Rome in 267 A.U.C. (486 B.C.), from the era of Pope Zacchary to that of Sisto IV, from Paul V to Pius IX, from Cato to Napoleon and Mazzini, all legislative measures have been brought to naught by the stubborn resistance of malaria.

Quotations are given from Giustino Fortunato, from Stendhal's *Promenades dans Rome* and the *Vie de Napoleon*, from LANCISI, who in 1717 wrote his work *De noxiis paludum affluviis eorumque remediis*, and stated that marshes were the cause of the fever owing to the transformation of minute worms into "stridulous culices," and that "the poisoned animals kill not by the wounds they inflict, but by infusing a poisoned liquid through the wounds." Dante, Horace, and even Homer are drawn upon (the last appears strange when quoted in Italian). Coming to more modern times, the author briefly reviews the history of malarial research, and tables are given to show how greatly malaria has been reduced between 1906 and 1914 as a result of preventive measures. He next passes to the Isthmus of Panama, and describes GORGAS's anti-mosquito work and the success which attended it. The history of the introduction of Cinchona is then spoken of, and further statistics given as to the general diminution of the deaths in Italy from malaria from 15,987 in 1888 to 2,042 in 1914. He shows how the spade and the plough, proper cultivation of the soil, coupled with protection from, and war against, mosquitoes, have worked wonders in reducing the malarial incidence.

The whole paper is delightfully written and interesting to read, and might well be entitled "Literary Wanderings in the History of Malaria."

H. Harold Scott.

ROMBY (Paolo). **Studi sulla malaria.**—*Giorn. di Med. Milit.* 1922. Oct. 1. Vol. 70. No. 10. pp. 449–460.

A valuable and careful exposition of fifteen years' experience of malaria in many of the countries forming the Mediterranean littoral. Primary carriers, those showing parasites without present or previous symptoms, are given as 38 out of 140 specially examined with that end in view. Having not infrequently observed the simultaneous presence of the tertian and subtertian parasites, he has no use for the unity of species, although he holds that he has seen conversion of *Plasmodium vivax* into "*P. immaculatum.*"

C. L.

RIEUX (J.). **L'évolution de l'infection malarique chez les paludéens.**—*La Médecine.* 1922. Dec. Vol. 4. No. 3. pp. 187–191.

——. **A propos du "paludisme chronique" des paludéens rapatriés.**—*Jl. des Practiciens.* 1922. June 3. Vol. 36. No. 22. pp. 353–356.

A general consideration among the repatriated to France leads again (this *Bulletin*, Vol. 19, p. 577) to a discussion on chronic malaria.

Rieux reiterates his conviction that malaria dies out, when reinfection is impossible, in from 12 to 15 months, and he lays down the axiom that to diagnose malaria without finding parasites in the peripheral blood is unscientific and unacceptable. Yet he gives no warning to the ordinary French practitioner (to whom the papers are addressed) that the finding of parasites in the peripheral blood of those whom subsequent examination shows to be actually harbouring them may not be accomplished by the most skilful; so that he who refuses to admit the possibility of malaria unless he find the parasite will constantly fail in maintaining his diagnostic reputation and in carrying out his duty to his patients.

C. L.

MÜHLENS (P.) & KIRSCHBAUM (W.). **Parasitologische und klinische Beobachtungen bei künstlichen Malaria- und Recurrensübertragungen.** [Parasitological and Clinical Observations on Malaria and Relapsing Fever Experimentally Transmitted.]—*Ztschr. f. Hyg. u. Infektionskr.* 1921. Vol. 94. No. 1. pp. 1–28. With 12 figs.

The writers have infected 88 cases of general paralysis of the insane with malaria or relapsing fever. Four of them died, three from heart failure and the fourth from haemorrhages attributed to quinine idiosyncrasy. Infection was by direct transfer of defibrinated blood from case to case. In this way benign tertian malaria was transmitted to 59 cases, 20 of them forming a continuous chain of descent, the rest being collaterals. Quartan infection was passed on to 5 cases, 3 in direct descent; and subtertian infection to 9 cases with a direct chain of 4. The tertian chain extended from March of one year to June of the next. In no instance did tertian breed other than tertian, quartan than quartan, subtertian than subtertian. Incubation periods for the three species were: 5–29, usually 10–19, days for tertian; 15–50, usually 30–36, for quartan; 7–14 days for subtertian malaria; and 3–8 days for relapsing fever. Clinical manifestations were typical but rather light. Reaction to quinine was mainly good, 0·5 gm. daily being usually effective, although double this quantity had sometimes to be used, the total dose for a course being 6–8 gm. (90–120 gr). No strain of quinine-tolerant parasites was induced; when the dose has to be increased, it is attributable to some characteristic of the host, so that the action of quinine would be an indirect one. Indigenous *Anopheles maculipennis* were infected with subtertian malaria in winter time and from a person taking quinine. Reinfection with tertian malaria could be induced nine weeks after the original attack. For relapsing fever 0·45 gm. of neosalvarsan was not specific.

C. L.

DI PACE (Ignazio). **Sulla efficacia dei vari agenti di mobilizzazione ematozoaria per la diagnosi della malaria latente.** [Efficacy of Various Provocatives in Diagnosis of Latent Malaria.]—*Policlinico.* Sez. Prat. 1922. Dec. 18. Vol. 29. No. 51. pp. 1658–1660.

The work of eight years, most at least of which has already been published, is here summarized. The most effective provocatives for the lighting up of latent malaria are held to be, in order of diminishing value, the injection of nitrate of strychnine; injection of the extracts

of the ductless glands, adrenal, thyroid and pituitary: and proteid shock, as induced by the injection of horse-serum, milk or antityphoid vaccine. These are held to be active agents, provided only a febrile reaction be induced; the same holding good for vaccinia.

C. L.

VIALATTE (Ch.). **Essai de coordination de quelques données relatives à la biologie des parasites du paludisme.**—*Arch. Instituts Pasteur de l'Afrique du Nord.* 1922. Sept. Vol. 2. No. 3. pp. 341–348. With 2 charts.

Commenting on the quantity and quality of malarial literature and the antagonism between the unicists and pluralists the writer puts forward the following as established principles:—(1) There is multiplicity of morphological types comprising, in addition to the three common forms infesting man, *Plasmodium falciparum quotidianum*, Craig, 1915; *P. falciparum mitis* and *P. falciparum immitis*, Grassi and Sella, 1920; *P. tenue*, Stephens, 1914; *P. falciparum caucasicum*, Marzinowski; *P. vivax minuta*, Ahmed Emin, 1914. In addition MARCHOUX notes different geographical races. All the described species then grade into one another. (2) There is seasonal alteration of the different morphological types of such a nature that when *P. vivax* predominates *P. falciparum* lessens, and vice versa. It is a striking fact that in every country one and the same type of plasmodium predominates at the time when anopheline activity is at its greatest. (3) Cultivation of plasmodium in vitro can give different forms from those with which the tube was inoculated, so that the morphological characters which gave us the basis of classification are not fixed. (4) The plasmodia of man are not infective for animals, so that humoral reactions are evidence of specific differences greater than the morphological affinities. (5) The infective power of mosquitoes disappears during hibernation, so that the infection is carried on by man, and yet the type of plasmodium which predominates at the begining of the new cycle differs from that predominating at the end of the old one.

Practically all that is here quoted is given in italics in the original. It is not a collection of statements of fact, but of conclusions, with whose validity there is no rational need to agree.

C. L.

STEPHENS (J. W. W.). **A New Malaria Parasite of Man.**—*Ann. Trop. Med. & Parasit.* 1922. Dec. 30. Vol. 16. No. 4. pp. 383–388. With 1 chart in text and 1 coloured plate.

In a man who had acquired malaria in 1916 in East Africa there were observed in April and May 1918, and again on 19th and 20th July of the same year simple tertian parasites. In films taken between the 21st and 24th of that month no parasites were found. On the 28th and 29th anomalous forms appeared, and a series of films extending from the 28th July to 1st August showed that the periodicity of the parasites appeared to be tertian, a rise of temperature on 28th and 30th falling in with this suggestion. The exceptional forms possess these characters. The small rings have no special features and in stained films show no evidences of motility; they lie in red corpuscles not uncommonly oval and with irregular fimbriated margins, not enlarged, and generally without Schüffner's dots. The medium forms are non-amoeboid; pigmented, this in stained forms

appearing brownish-black, and granular rather than spicular; compact, with complete absence of "straggling"; round and oval, not bandlike and meridional, although "the amount of chromatin and the distribution of the pigment in a lateral band are appearances which recall quartan." In forms with one chromatin mass this is often lateral and roughly triangular. The infested erythrocyte is so often oval that the shape is held to have actual significance. Schüffner's dots are well marked. The maximum number of merozoits appears to be 12, lying in a decolorized normal or slightly enlarged cell with Schüffner's dots. Some few of the forms, even at this stage, are indistinguishable from simple tertian parasites; a single double infection of a red corpuscle by two quarter-grown parasites was noted. No gametocytes were seen. It is noted that the parasite resembles that seen by AHMED EMIN in 1914 in six pilgrims at Camaran in the Red Sea and named "*Plasmodium vivax minuta*" [see this *Bulletin*, Vol. 4, p. 88] but, owing to an inability, on the material available, to come to a decision on the identity of the two forms, the new one is designated *P. ovale*. A plate of beautiful coloured drawings illustrates the paper.

If this parasite be a specific form and not a sport (the administration of quinine is not mentioned, so presumably it was not given), and if one hold that in the face of inability to come to a decision on the matter this form should not be separated specifically from EMIN's, then, under the Code of Zoological Nomenclature, EMIN's name would hold. For under the Code, if a subspecies be raised to specific rank, the subspecific name becomes the specific name. Under these circumstances the valid name of this parasite would be *P. minutum*, since the specific name must agree in gender with the generic.

The matter is further complicated by the fact that ZIEMANN [see this *Bulletin*, Vol. 7, p. 25] deliberately—and unjustifiably—renamed Emin's parasite *Plasmodium camarense* Emin, on the ground that EMIN's designation was descriptively inapplicable. Zoological names are, however, no more descriptive than are the often singularly inappropriate surnames of men, and when in addition, as ZIEMANN's designation implies, EMIN is cited as father of a name of whose conception he is innocent and of whose birth he is ignorant, a position is produced which is both ludicrous and confusing. C. L.

LEGER (Marcel) & BÉDIER (E.). **Considérations sur la morphologie du *Plasmodium praecox* à propos d'un cas d'accès pernicieux.**—*Bull. Soc. Path. Exot.* 1922. Dec. 13. Vol. 15. No. 10. pp. 1010–1015.

A comatose negro boy of 18 months showed on blood examination an intense infection with *Plasmodium praecox*, 40 per cent. of the erythrocytes harbouring parasites, there being 53 parasites per 100 corpuscles. In appearance 72·5 per cent. of the parasites were normal; 9·5 per cent. amoeboid, a condition increased by quinine; 4 per cent. bacilliform; 3·5 per cent. were held to be young gametocytes; 8·5 per cent. were segmenting forms with 6 to 22, generally 10 to 16, merozoits; and 2 per cent. unplaced forms. In most parasitized corpuscles Maurer's, or Stephens and Christopher's, dots were present. The child recovered under energetic quinine treatment. BALFOUR and WENYON's suggestion that these forms are prelethal, as well as STEPHENS's that they constitute the species *P. tenue*, are rejected in favour of that of MACFIE, SERGENT and CRAIG that they constitute a reaction to malarial toxins. C. L.

BRAU (P.). **Paludisme à** *P. falciparum.* **Diagnostic et traitement.**—*Bull. Soc. Path. Exot.* 1922. Nov. 8. Vol. 15. No. 9. pp. 834–843.

When the microscope fails to reveal the malarial parasite, even after provocative treatment, the value of a large mononuclear count (including under this category all mononuclears larger than a polymorph) of 10 per cent. or over is stressed, such cases clearing up under quinine. If, however, pulmonary or renal congestion complicate the malaria, as indicated by rhonchi at the posterior base, and by albumin or casts in the urine with lumbar pain, or if there be gastric symptoms, there may be an excess of polymorphonuclear leucocytes. For treatment the administration as a routine of quinine by mouth is advised, given as follows: On the first day 2 gm. [30 gr.], on days 2, 3, 4, 8, 9, 10, 17, 18, 19, 23, 24, 25, nothing; on the other days, up to the thirty-first, 0·5 gm. of quinine hydrochloride. In the case of difficulties the value of the rectal route is emphasized, percutaneous injection being less favoured. Injections of colobiase of quinine for chronic cases, cupping of the back or loins in pulmonary and renal congestions, comprise the chief armentary; with the addition that ascariasis and taeniasis must be combated if present, ankylostomiasis being apparently considered unworthy of particular note.

C. L.

LOTKA (Alfred J.). **Contribution to the Analysis of Malaria Epidemiology. I. General Part. II. General Part (continued). Comparison of Two Formulae given by Sir Ronald Ross. III. Numerical Part.**

SHARPE (F. R.) & LOTKA (Alfred J.). **IV. Incubation Lag.**

LOTKA (Alfred J.). **V. Summary.**—*Amer. Jl. Hyg.* Baltimore. 1923. Jan. Supp. Vol. 3. pp. 1–37. With 4 figs. pp. 38–54; pp. 55–95. With 9 text figs. pp. 96–112. With 4 text figs. pp. 113–121.

If the reader will assume that an infective mosquito will bite not oftener than once, that mosquitoes which bite two or more healthy persons and then an infective person are non-existent, that the balance of unfed infective mosquitoes is the same at the beginning and end of a month, that the changes in the malaria rate are sufficiently slow, that the mean longevity of a mosquito is 10 days, that 23 per cent. of malaria cases recover monthly, that a quarter of infected human beings and one-third of infected mosquitoes are infective, that a mosquito bites a human being 0·824 times monthly, that immigrations of man and mosquitoes are absent, and if he be completely at home in the calculus, then he may profitably pursue the writer through the 120 pages and 441 equations by which, following Ross, this mathematical thesis is built up and applied to the practical problem of the incidence of malaria. The points particularly considered are malaria equilibrium, due either to absence of malaria or to the fact that new infections are just balanced by deaths and removals. Ross's conclusions are brought out, and it is shown "that the course of events, as defined by Ross's equations, is represented by a family of curves on a surface having a depression or pit, as it were, at a point of stable equilibrium, whereas unstable equilibrium corresponds to a raised point of peculiar character." Of Ross's two formulae it is concluded that that given at Sect. 66 of his book, "The Prevention of Malaria," is of more exact and more general application, while that found in Sect. 27 applies "to the particular case in which the malaria rate in

the human population bears, nearly, that particular ratio to the malaria rate among mosquitoes which prevails when equilibrium is established." It is concluded, too, that the incubation lag has no effect upon the position or stability of malaria equilibrium; it merely delays its establishment.

C. L.

INGRAM-JOHNSON (R. E.). **Dengue v. Malaria.**—*Jl. Trop. Med. & Hyg.* 1923. Jan. 15. Vol. 26. No. 2. pp. 27–28.

In extending his former conclusions that dengue produces an immunity to malaria [this *Bulletin*, Vol. 19, p. 579], the writer develops the following argument. *Bacillus typhosus* undergoes, under cultivation, wonderful metamorphoses, from some of which exude clumps of almost ultra-microscopic granules. Yet from these clumps the full-sized bacillus can be reproduced. Malaria is carried by *Anopheles maculatus*, dengue by *Culex fatigans*, the germ of the latter being ultra-microscopic. The fate of the malarial parasite is established, but what happens if it be swallowed by Culex? Can it be possible that in two species so closely related the parasite should be digested in the one and not in the other? Is it not more reasonable to suppose that the malarial parasite splits up into ultra-microscopic organisms, which, on injection into the human host, produce dengue? It may be suggested in comment that the issues are not so clearly cut as the argument suggests.

C. L.

FERNBACH (H.). **Akute gelbe Leberatrophie, Malaria und Salvarsan.** [Acute Yellow Atrophy of Liver, Malaria and Salvarsan.]—*Med. Klin.* Berlin. 1922. Mar. 5. Vol. 18. No. 10. pp. 306–308.

ISAAC-KRIEGER (K.) & LÖWENBERG (W.). **Gehaüftes Auftreten von Malaria in Verbindung mit Lues und Salvarsan.** [Lighting up of Malaria by Salvarsan in Syphilis.]—*Ibid.* Aug. 6. Vol. 18. No. 32. pp. 1024–1025.

WESENER. **Ein Fall okkultur Malaria, durch Salvarsan manifest geworden.** [Case of Latent Malaria lighted up by Salvarsan.]—*Muench. Med. Woch.* 1922. Nov. 24. Vol. 69. No. 47. pp. 1626–1627.

HANEL (Günther). **Die malariaerkrankungen der Berliner Bevölkerung und der Zusammenhang mit der antiluetischen Salvarsantherapie.** [Malaria in Berlin in relation to Antisyphilitic Salvarsan Treatment.]—*Med. Klin.* 1922. Dec. 17. Vol. 18. No. 51. (No. 941.) pp. 1615–1617.

The 27 cases considered in these communications indicate the interest taken in Germany on the subject of salvarsan in malaria. It is laid down that when fever follows the administration of salvarsan an activated malaria should always be considered as the likely cause. In practice the diagnosis of malaria was not made in these cases until hospital was reached. In connexion with a death from acute yellow atrophy of the liver a grave warning is issued that the provocation of active malaria by injection of salvarsan is not to be lightly undertaken.

C. L.

ROSENBERGER (F.). **Malaria tropica unter dem Bild der Dysmenorrhoe.** [Malaria presenting Dysmenorrhoea Picture.]—*Med. Klin.* Berlin. 1922. Oct. 29. Vol. 18. No. 44. pp. 1409–1410.

GÜNTHER (B.). **Ueber einen Fall von Malaria mit einer dem Erythema nodosum ähnlichen Hautaffektion.** [Malaria Case with Skin Lesions resembling Erythema nodosum.]—*Ibid.* Nov. 12. No. 46. p. 1467.

The diagnosis of malaria in each of these cases is made upon the finding of a single parasite during the examination of a number of films. In the first case it occurred in a thin film which is stated to have contained almost no leucocytes, those present being almost exclusively lymphocytes, and was a dividing form ; a thick film was negative. In the second a single rather delicate, rather small, rather blue ring was found in a red blood corpuscle, coupled with a tertian fever disappearing under quinine, while erythema nodosum relapsed with the advent of fever.

C. L.

SINTON (J. A.). **Results of Some Experiments in the Treatment of Malaria with Alkali combined with Quinine (Preliminary Note).**—*Indian Jl. Med. Res.* 1923. Jan. Vol. 10. No. 3. pp. 850–856.

Citing the work of ACTON [this *Bulletin*, Vol. 19, p. 103] and MICHAELIS* that quinine is more lethal to Paramoecium and to bacteria in alkaline than in acid media, MACGILCHRIST's arguments indicating an acidosis in malaria, and war experiments showing that it successfully disinfects only a small percentage of malaria cases, SINTON notes, " It would appear that some adjuvant is needed to assist quinine, is this adjuvant alkali ? " The point was tested by treating malaria cases, microscopically proved, with these two mixtures.

A.	Sod. bicarb. ..	gr. 60	Q.	Quin. sulph. ..	gr. 10
	Sod. citrat. ..	gr. 40		Acid sulph. dil. ..	♏ 10
	Aq. ..	ad ℥ 1		Mag. sulph. ..	gr. 60
				Aq. ..	ad ℥ 1

All cases were given an ounce of magnesium sulphate before treatment, for the first day of treatment four doses of A and two of Q, and for the subsequent days three of each. Controls were given the quinine mixture at the same hour as the test cases, but the alkaline mixture was omitted. The total amount of quinine given to each case was 110 gr. The experiment took place during June, July and August on prisoners in the Lahore jail, so that, it is concluded, apparent relapses must have included a certain number of fresh infections. Cure was accepted if no parasitic relapse appeared during eight weekly examinations. Controls and test cases were taken in strict alternation.

Of 43 cases of benign tertian malaria treated with quinine and alkali, 72 per cent. were cured, of controls 60 per cent. Fever was more rapidly controlled after alkali, its average duration after the first dose being 0·27 days, as against 0·48 days in controls and 1·66, according to MACGILCHRIST, in Bengal. Similarly in a small series of cases taking cinchona febrifuge with alkali the disappearance of fever was more rapid than in a similar series in which the alkali was omitted.

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* Dependence of Action of Quinine Alkaloids on Bacteria on Alkalinity.—*Klin. Woch.* 1922. Vol. 1. p. 321.

In malignant tertian malaria 18 cases treated with quinine and alkali showed 72 per cent of cures, while 14 taking quinine only gave 36 per cent. of cures only. In four cases showing very numerous crescents these disappeared after four days' treatment.

C. L.

NOGUE (M.) **Observation clinique de l'accès pernicieux étudié ci-dessus au point de vue bactériologique. Posologie de la quinine chez les enfants du premier âge.**—*Bull. Soc. Path. Exot.* 1922. Dec. 13. Vol. 15. No. 10. pp. 1016–1017.

The interest of this paper, which has nothing to do with bacteria, but describes the recovery of a child of 22 months from a grave comatose attack of subtertian malaria in which 40 per cent. of the erythrocytes were infected, lies in the dosage of quinine adopted for such cases in Dakar. This amounted to the intramuscular injection of 1 gm. (15 gr.) daily for three days. It is held that Dr. LE DANTEC saved his own daughter of three years old by injections of 2 gm. daily continued for three days, while Dr. KERNE gives to infants 0·5 gm. on the first day, and Marcel LEGER has given 0·6 gm. daily.

C. L.

FEDERATED MALAY STATES. **Annual Report of the Institute for Medical Research for the Year 1921.** [FLETCHER (William), Acting Director, Govt. Laboratories, F.M.S.]—13 pp.

Forty-four cases of cachectic malaria classed by others than the reporter as quinine-resistant were each examined microscopically an average of 23 times during four weeks of treatment, 19 times in thin and four in thick films. During this period quinine was administered as bihydrochloride in gelatin capsules or in solution, as the sulphate in gelatin capsules, and as cinchona febrifuge in gelatin capsules. In every case the dosage was 10 gr. twice daily, and Dr. Fletcher satisfied himself personally that every dose was swallowed. Under these circumstances parasites disappeared from the blood by the fifth day, except in one case of quartan infection, in which this was delayed till one day later, and in one woman, infected with malignant tertian malaria, in whom, in spite of all treatment, parasites remained for five months. The composition of cinchona febrifuge varies in India and Java thus :—

	India	Java.
Quinine	7·40	11·5
Quinidine	22·83	5·0
Cinchonine	18·58	26·3
Cinchonidine	5·84	20·0
Uncrystallizable alkaloids, ash, etc.	45·35	37·2
	100·0	100·0

Its price is a quarter of that of quinine, but having no fixed pharmaceutical composition it is clearly liable to adulteration. The immediate effect of the febrifuge in producing disinfestation was found to be equal to that of quinine. Its permanent effect was probably equally good, although, with reinfection occurring, this was more difficult to estimate. In one case it agreed when quinine had to be discarded as producing vomiting and menorrhagia.

C. L.

SCHALK (Hermann). **Zur Frage der Chininresistenz bei Malaria tropica.** [Quinine Resistance in Malaria.]—*Deut. Med. Woch.* 1922. Oct. 20. Vol. 48. No. 42. p. 1415.

In Mesopotamia were seen four Europeans with subtertian malaria who did not react to ordinary or to increased quinine dosage, administered over periods of from three to 10 days. One had also relapsing fever and another blackwater fever. They are held to be cases of primary, not acquired resistance to quinine.

C. L.

TREUTLEIN (Adolf). **Bad Kissingen und seine Heilmittel für Blutkrankheiten (Malaria, Bleichsucht, etc.).** [Bad Kissingen and its Cure in Blood Affections (Malaria, Chlorosis, etc.).]—*Muench. Med. Woch.* 1922. Apr. 28. Vol. 69. No. 17. pp. 628–629.

Nine cases of chronic malaria were treated at Bad Kissingen with quinine by Nocht's method, baths and draughts of the hot springs, with provocative methods before and after. A month later the haemoglobin had risen from 48–80 per cent. to 95 per cent., and the red cells from 2–3 million to 4½ million, and the patients were regarded as cured. The data given are insufficient to test the statement.

A. G. B.

WHITMORE (Eugene R.). **The Action of Light in the Production of Relapse in Malaria.**—*Amer. Jl. Trop. Med.* Baltimore. 1922. Sept. Vol. 2. No. 5. pp. 475–485.

LENZ having produced evidence that sunlight causes malaria to relapse [but see this *Bulletin* Vols. 10 and 16, pp. 157 and 355], and leaving out of consideration for the moment the question whether provocative measures induce relapses or redistribution of the parasites within the body, controlled experiments have been begun, using canaries and *Plasmodium relictum*. The effects of violet light were noted, precautions being taken to insure that it reached the skin. If it do so sufficiently, relapse of infection occurs, but the value of the feathers in protecting the bird is evidenced by the observation that at 24 inches violet light produces the same effect in two hours as it does in 15 minutes without feathers. With regard to SCHAUDINN's belief that relapse is caused by development of schizonts from gametocytes, a belief which from the biological standpoint has been shrewdly mauled [this *Bulletin*, Vol. 11, p. 22], it was pointed out by THAYER in 1897 that injection of blood containing gametocytes of malaria will not produce infection in another person, nor, in the lower animals, can the injection of gametocytes of other protoza, such as *Haemoproteus*, transmit infection.

[The evident care with which the work is proceeding should yield valuable and reliable results.]

C. L.

SINTON (J. A.). **The Situation of the Malarial Parasite in Relation to the Red Blood Corpuscle.**—*Indian Med. Gaz.* 1922. Oct. Vol. 57. No. 10. pp. 367–371. With 11 text figs.

If the malaria plasmodium be ectoparasitic on the erythrocyte, as ROWLEY-LAWSON holds, lying generally in the cupped shelter of one surface, and if the corpuscle could be made to renounce its natural

form in such a way as to bring the parasite, so to speak, upon the horizon, into such a position, that is, that it could be seen in profile, the point would be capable of settlement; and a number of drawings are made illustrating the position postulated. By crenating erythrocytes with hypertonic, and ballooning them with hypotonic saline Sinton believes that he has seen these conditions in profile and *en face*, in unstained parasites, in fixed and stained parasites, and in sections of erythrocytes. In support of the suggestion it is held that the optimum habitat for an extracorpuscular parasite would be one of the concave corpuscular surfaces, where it would be protected from jolting by other parasites, and where, should it attempt to escape thence, jostling erythrocytes would rap it over the pseudopodia and keep it in its place.*

COMES (Salvatore). **Appunti di biologia malarica: Modo di nutrizione e genesi del pigmento nel parassita malarico (nota terza).**—*Arch. f. Protistenk.* 1922. Vol. 45. No. 3. pp. 401–409.

In *Plasmodium vivax* and *P. malariae*, pigment is held to be formed by the nutritive vacuole, acting under the direction of the adjacent nucleus, for the reason that the pigment is held to appear first in the region of the vacuole. In the case of *P. praecox*, in which the gametocyte only is considered, the nucleus is held to produce the pigment direct and without the intermediary of a nutritive vacuole. That the pigment may be ultimately derived from the haemoglobin of the erythrocyte is not denied.

C. L.

RADOSAVLJEVÍC (Alex). **Ueber das Komplement bei Malaria.**—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1. Teil. Orig. 1923. Vol. 35. No. 5–6. pp. 429–446.

The results of 330 examinations of the blood of 40 malarial cases are tabulated in this paper. The conclusions reached are that the complement content of malarial blood is less than that of normal blood, and considerably less than that of other infectious illness of man. This diminution is effected during the pre-paroxysmal period, but whether it be due to a physical condition of the serum induced by the disruption of plasmodia and erythrocytes, or to anaphylactic shock, is undetermined.

C. L.

SERGENT (Et. & Edm.). **Étude expérimentale du paludisme des Oiseaux** (*Plasmodium relictum*). **Suite des recherches sur l'action de la quinine (XXIIIe note). Suite des essais de traitement préventif ou curatif par des produits autres que la quinine (XXIVe note).**—*Arch. Instituts Pasteur de l'Afrique du Nord.* 1922. Sept. Vol. 2. No. 3. pp. 320–329; & 330–340.

i. The action of quinine on *P. relictum* was thus tested:—A. on the sporozoits: (1) The crushed thoraces of 4–6 infective culices were injected into canaries, who received, immediately afterwards, an

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* To be dragged out of the conventional rut is often stimulating, but, when coming unwarned upon "mu" when expecting "μ," stimulus is apt to pass into shock.

injection of 1 mgm. of quinine. Two died intensely infected; one showed a very feeble infection; two remained uninfected, one of these becoming heavily infected from a reinoculation. Of controls, two experienced fatal infections; in the third infection was milder than in the corresponding quininized birds.

(2) Two to eight infective culices were allowed to feed on each of four canaries, each of which then received an injection of 1 mgm. of quinine. All the birds experienced heavy infections.

B. on the schizonts *in vitro*: One drop of blood, containing one parasite per immersion field, was mixed with varying quantities of citrate solution and of quinine, with the results seen in the accompanying Table. The conclusion drawn is that in such instances if the dilution of quinine be increased the dosage must also be increased.

	Drops of citrate solution added.	Dose of quinine given, in milligrammes.	Effect produced
1	1	0·005	Normal infection.
2	1	0·005	,, ,,
3	1	0·005	,, ,,
4	1	0·005	,, ,,
5	1	0·075	,, ,,
6	1	0·075	No infection; no immunity.
7	1	0·1	,, ,,
8	1	0·1	,, ,,
9	6	0·1	Normal but delayed infection.
10	6	0·1	,, ,,
11	8	0·2	Normal infection.
12	8	0·2	,, ,,
13	8	0·2	,, ,,
14	8	0·2	No infection; relative immunity.
15	8	0·2	No infection; no immunity.

ii. The half, sometimes the whole of the spleen of a healthy rat or canary, broken up in two or three drops of normal saline, was injected into canaries, and after an interval varying from a few minutes to 11 days they were inoculated with *P. relictum*. In one of the three cases in which canary spleen was used the infection was unaltered; in the other two it was attenuated as compared with controls. In five of the seven cases in which rat's spleen was used the infection was unaltered; in two it was attenuated, one showing and one not showing a relative immunity to a subsequent infection. In two cases 1 cgm. of Dausse's aqueous extract of spleen was used, without evident effect. Injection of canary spleen during the incubation period of an artificially induced infection eliminated the infection in one case without producing immunity. In the other two cases the infection was more or less controlled. Intra-peritoneal injection of asaprol, even in sublethal doses, produced no effect upon an active infection. Blood taken from a vertebrate (canary, pigeon, rat or guinea-pig) into whose peritoneal cavity quinine had been injected, had no curative effect in 11 cases, but, used as a preventive, attenuated infection in two of the birds.

C. L.

KONSULOFF (S.). [**Die Bekämpfung der Malariamücken in den Reisfeldern.** [The Control of Malaria Mosquitoes in Rice Fields.]—*Ztschr. angew. Ent.* Berlin. 1922. May. Vol. 8. No. 2. pp. 283–294. [Summarized in *Rev. Applied Entom.* 1922. Oct. Vol. 10. Ser. B. Pt. 10. pp. 193–195.]

The control of the breeding of mosquitoes in rice fields was investigated by CELLI and CASAGRANDI for Culex. Finding that the resistance of the two genera varied, Konsuloff investigated the effect of heat and drought upon the breeding of Anopheles.

A temperature of 32° C. (89·6° F.) in water affects no stage but the pupae, some of which died ; on damp earth a few of the first and second stage, and all the third stage, larvae, and some pupae died. A temperature of 35° C. (95° F.) for 24 hours in water killed all the first and second stage and some pupae; on damp earth all larvae (except two of the second stage) and some pupae died. A temperature of 37° C. (98·6° F.) for 24 hours in water killed all larvae and nearly all pupae ; for six hours on damp earth was fatal to all stages.

Desiccation for 43 hours killed all stages ; if continued for a few hours only, the second and third stages were imprisoned at the bottom when the mud was flooded ; but while the third stage larvae managed to free themselves, those of the second stage did not and were all drowned.

These experimental conditions were tested on a rice field of 300 sq. metres emptied for 48 hours in July. After flooding, a fraction of the field was examined and yielded no larvae, while 1,576 were recovered per square metre from a similar control area.

It is suggested that South Europe rice fields should be drained for the following periods :—one five-day draining in April, two four-day drainings in May and two in June, two three-day drainings in July and two in August, and two four-day drainings in September, on the ground that, larval development taking a month in these localities, each individual would be exposed twice during that period to the sun's rays.

C. L.

i. ECKSTEIN (F.). [**Die Verbreitung von** *Anopheles* **in Bayern und ihre mutmassliche Bedeutung für die Einschleppung der Malaria.**] [The Distribution of Anopheles in Bavaria and its Possible Bearing on the Introduction of Malaria.]—*Ztschr. angew. Ent.* Berlin. 1922. May. Vol. 8. No. 2. pp. 229–282. With 1 map. [Summarized in *Rev. Applied Entom.* 1922. Oct. Vol. 10. Ser. B. Pt. 10. pp. 192–193.]

ii. ECKSTEIN (Fritz). **Anopheles und Malaria in Bayern.** [Anopheles and Malaria in Bavaria.]—*Muench. Med. Woch.* 1923. Feb. 2. Vol. 70. No. 5. pp. 147–148.

i. Malaria has almost disappeared from Bavaria during the last 50 years, coincident with the fall of the subsoil water, the result of drainage. The chance of the occurrence of epidemic malaria is considered remote.

ii. This communication stresses the importance of cultivation in the causation of the decrease of malaria in Bavaria. But the main factor is felt to be inherent in the thermotropism of the anopheles, it being held that in the last decades stables have become warmer and dwelling rooms cooler. He refers apparently still to the last 50 years.

C. L.

SEIDELIN (H.). **Au sujet des comprimés de quinine.**—*Bull. Soc. Path. Exot.* 1922. Oct. 11. Vol. 15. No. 8. pp. 686–690.

BLANCHARD (M.). **A propos de la note de** H. SEIDELIN **"Au sujet des comprimés de quinine."**—*Ibid.* pp. 690–691.

LEGER (M.) & BÉDIER (E.). **La quinine sous forme de comprimés et son élimination par l'urine.**—*Ibid.* Nov. No. 9. pp. 870–872.

LANGERON (Maurice). **A propos des comprimés de sels de quinine.**—*Ibid.* No. 10. pp. 959–961.

Commenting upon the vivacious communication of BLANCHARD (this *Bulletin*, Vol. 19, p. 872) SEIDELIN points out that tablets are unquestionably the most convenient and popular form of administration of quinine, and one not to be lightly rejected. He selected 12 persons, divided into six pairs, the individuals in each pair being, as far as possible, of the same physical standard. To one person in each pair he gave 0·25 cgm. of hydrochloride of quinine, and to the other the same quantity in solution, and he tested the urine of each person eight times from one to 24 hours after administration. The experiment was repeated some days later, except that those who had had the tablets now had solution, and vice versa. The tables show a slightly greater excretion, and presumably a slightly greater absorption, of quinine, from the tablets than from the solution. A comparison of the excretion of euquinine taken in powder and in tablet form gave a slight advantage to the powder. The urine test was by Giemsa's and not by Tanret's reaction, namely :—Perchloride of mercury 27, water 1,500 ; potassium iodide 100, water 500 ; mix, add glacial acetic acid 20. He holds with the weekly administration of 1 gm. of quinine on two consecutive days, and adds, which is, as he points out, a personal belief, that if the dose be varied it should be with the intention of adjusting it to that dose which actual experience shows to be necessary at that time and place for the treatment of active malaria.

BLANCHARD in reply quotes from literature instances of durability of tablets which have indeed merited the pseudonym of "brickbats," and urges that the real value of the controversy lies in its drawing attention to the need of verifying the quality of tablets in use. The Society drew the attention of the Ministry of the Colonies to the matter.

LANGERON points out that the daily press has taken up this question with habitual incompetence and inopportuneness, so that the advantages laboriously gained are in danger, and all tablets are being damned by reason of the fraudulent nature of the few. Of types, there is the fragile uncoated one with its excessive bitterness, the sugar-coated type (as exemplified by the products of what is thinly veiled under the description of a great English firm), whose disintegration is in two phases, the solution of the sugar coat and the crumbling of the central mass, it being held, curiously enough, that in certain stomachs the sugar is not soluble ; and a globular pill compounded with gum and very difficult of solution, but not really a compressed drug at all. As a binding material, amidol is advised. It is pointed out that tablet medication need not be anything but satisfactory if the proper tablet be chosen.

In view of the consternation which BLANCHARD's condemnation of the quinine tablet has produced in the French Colonies LEGER and BÉDIER have repeated his experiments. BLANCHARD had examined 44 persons, found the tablets, more or less serviceable, in the faeces of 22 of them, and obtained Tanret's reaction in the urine of 5 only.

The writers report upon 145 cases, 47 Europeans and 98 natives, using four different sets of tablets of quinine hydrochloride, with one, two or three urine examinations from the third to the eighth hour. The only case in which the reaction was absent was one in which there was only a single examination four hours after administration. The result being in entire disagreement with those of BLANCHARD, obviously it is the particular tablets, of unknown origin, possessed by the latter which are at fault, and there is no justification for the general condemnation of that most convenient form of medication.

C. L.

HECKENROTH (F.). **Mesures capables d'enrayer le paludisme à Dakar.** —*Bull. Soc. Path. Exot.* 1922. Dec. 13. Vol. 15. No. 10. pp. 1024–1032.

A Commission appointed to consider the prevalence of malaria in Dakar, despite half a million francs spent on its attempted elimination by a programme instituted in 1901, makes the following recommendations. The public water supply, being insufficient, is intermittent, necessitating intermediate storage within or without houses: the cisterns breed anophelines: powers are required for the adequate inspection of inside cisterns. The water supply is supplemented by wells which, insufficiently protected, afford ideal breeding-grounds. The penalties for permitting stagnant water are inadequate, and the Administration is itself very lax in this matter, even providing public fountains with no means of removing the overflow. Defects in the rain-water drainage system and the distributing system for potable water produce numerous breeding-places. The real difficulty is a lack of sanitary conscience, both in Europeans and natives. A start has been made in the quininization, three times a week, of school children from May 1 to November 1. A new sanitary programme, to obtain an adequate supply of drinking water and the hygienic removal of waste water, is contemplated at a cost of a million francs.

C. L.

SERGENT (Edmond & Etienne). **Prophylaxie du paludisme. Programme sommaire d'une campagne antipaludique.**—*Arch. Instituts Pasteur de l'Afrique du Nord.* 1922. Sept. Vol. 2. No. 3. pp. 436–443. With 1 text fig.

This mere enumeration of some 200 different matters meriting special attention during an antimalarial campaign directs attention to the complexity of such procedures.

C. L.

i. BRANDENBURG (Kurt). **Ueber späte Malariarückfälle.** [Late Malaria Relapses.]—*Med. Klin.* Berlin. 1922. Apr. 16. Vol. 18. No. 16. p. 508.

ii. VIGNES (H.). **Paludisme et gestation.**—*Jl. des Practiciens.* 1922. July 22. Vol. 36. No. 29. pp. 467–468.

iii. VON WILUCKI. **Ueber einen fraglichen Zusammenhang von Epilepsie und Malaria.** [Possible Relationship of Epilepsy to Malaria.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1922. Vol. 26. No. 11. pp. 342–348.]

iv. DENTICI (S.). [**Roentgen Treatment of Malarial Spleen.**]—*Tumori.* Rome. 1922. July 25. Vol. 9. No. 1. p. 19. [Summarized in *Jl. Amer. Med. Assoc.* 1922. Oct. 14. Vol. 79. No. 16. p. 1369.

i. Three cases are noted in which malaria relapsed up to four years after infection. In one case injection of salvarsan precipitated the attack.

ii. A compilation under the following headings. Pregnancy confers no immunity against malaria, but, on the contrary, often lights up a latent infection and produces a severe attack. Malaria often causes premature delivery and severe symptoms during the puerperium. Intra-uterine foetal infection may or may not occur. Quinine should be given during pregnancy in the same doses as to the non-pregnant; FREDERICI, in 1902, published 49 malarial pregnancies all quinine-treated and all going to term except two with high fever.

iii. In 1917 an under-officer experienced an attack of malaria in which parasites of an unstated species were found. Epileptiform attacks occurred, persisting after the malaria was apparently cured. The possible causal relationship between the two is discussed at considerable length, and the conclusion is reached that an instance of "exogenous malarial epilepsy" is being dealt with.

iv. "Radiostimulation of the spleen in Chronic Malaria.—Dentici treated the large spleen with small stimulative doses of the roentgen rays in the case of a boy of 16 with chronic malaria. Then the spleen was removed, and the microscope showed unmistakable lymphoid hyperactivity."

C. L.

COULOGNER. **Détermination de l'index splénique des enfants en Haute-Volta.**—*Bull. Soc. Path. Exot.* 1922. Oct. 11. Vol. 15. No. 8. p. 765.

FABBRI (G.). **La Malaria nella questione meridionale.**—Supplement to *Ann. d'Igiene.* 1922. Vol. 32. 62 pp.

FALK (J.). **Die Malaria im Kindesalter.**—*Med. Klin.* Berlin. 1922. Sept. 10. Vol. 18. No. 37. pp. 1184–1185.

GARRISON (C. W.). **Problems encountered in maintaining Urban Malaria Control.**—*Southern Med. Jl.* 1922. May. Vol. 15. No. 5. pp. 352–358.

MARCIALIS (G.). **Sulla presenza di cellule emoistioblastiche e monocitoide nella milza malarica.**—*Gaz. degli Ospedali e delle Cliniche.* 1922. Mar. 16. Vol. 43. No. 22. pp. 259–261.

PRAT (Stéphane). **Considérations sur le paludisme et sa prophylaxie.**—*Arch. Méd. et Pharm. Milit.* 1922. Sept. Vol. 77. No. 3. pp. 298–306.

ROBERTO LARDE (Carlos) & ARTHES. **Anofeles de El Salvador y profilaxia paludica.**—*An. del Depart. Nac. Hig.* Buenos Aires. 1922. Jan. & Feb. Vol. 28. No. 1. pp. 17–35.

ROBERTS (Stewart R.). **The Influence of Malaria on the Circulation.**—*Amer. Jl. Trop. Med.* Baltimore. 1922. Sept. Vol. 2. No. 5. pp. 463–474.

WILLIAMS (Ennion G.). **Rural Malaria Control with the County as the Unit.**—*Southern Med. Jl.* 1922. May. Vol. 15. No. 5. pp. 362–368.

SLEEPING SICKNESS.

DUKE (H. Lyndhurst). **An Inquiry into an Outbreak of Human Trypanosomiasis in a "*Glossina morsitans*" Belt to the East of Mwanza, Tanganyika Territory.**—*Proc. Roy. Soc.* 1923. Jan. 4. Ser. B. Vol. 94. No. B 660. pp. 250–265. With 1 map.

The author is of opinion that information collected by him during a tour in July and August, 1922, of the country east of Mwanza, Tanganyika Territory, confirms in a very striking manner the views recently stated by him regarding the importance of direct transmission in the spread of sleeping sickness [this *Bulletin*, Vol. 15, p. 377].

The population of the district exposed to fly is estimated at about 16,000. During his tour Duke palpated 539 natives from villages actually in the fly scrub; 86 had suspicious enlargement of axillary glands on one or both sides. A single fresh blood preparation was examined from each and gland punctures were made in 57 cases: in addition fresh blood examinations were made of 77 sick, treated and untreated, at the three collecting stations, and trypanosomes were found in the first twenty fields in 37 of them. The distribution of the cases among the sultanates involved in the fly country is roughly as follows, counting from the first appearance of the disease:—Itirima 200, Ntussu 180, Usmao 20, Nassa 50, Msansa Mdogo 0, Mago 0, Ututwa 0 (?). The paper is illustrated by a map.

The disease apparently made its first appearance in the Igombe group of villages in the latter part of 1920, and the question arises, where did the trypanosome come from? SWYNNERTON [see p. 311] favours the introduction of a human trypanosome from outside the belt, possibly as the result of the movement of Belgian forces during the war. Duke points out, however, that the human trypanosomes of Tanganyika and Congo are of the *gambiense* type, whereas the outbreak in question is due to *T. rhodesiense*. He considers that, as the result of the undermining of the general vitality of the population due to the desperate famine of 1919 and early months of 1920, and the consequent greatly increased severity of ankylostomiasis, the local game trypanosome, *T. brucei*, obtained a footing in man. During the famine the natives were allowed to kill game for food and, in addition, ate up their small stock of domestic animals: as a result the fly were compelled to turn to man for food.

The course of the disease is, as a rule, rapid—according to the natives 3 to 8 months from the appearance of obvious symptoms. Oedema of the dorsal surface of the foot is usually the first sign noted by relatives, but often there is a history of headache and fever a week or two before. Signs of abdominal disturbance were common, but it must be remembered that a severe form of ankylostomiasis has existed for years in the district. A remarkable feature of the infection was the presence of numbers of parasites in the peripheral blood [this, in the reviewer's experience, is the rule in *T. rhodesiense* infections.]. In all the cases seen the axillary glandular enlargement was much more pronounced than that of the cervical region.

The majority of cases came from localities where both game and fly were relatively plentiful at the time of the author's visit, and in all there was ample evidence of a relatively recent diminution in the amount of game. Contrasting SWYNNERTON's and his own views of the situation, Duke writes as follows:—

"Swynnerton believes that a human trypanosome was introduced into the Belt from some outside infected area, and reached Igombe at a time

when there was a scarcity of game in that district. The fly, which were in consequence feeding extensively on man, became infected with the new parasite, which was thus spread through the population, partly by cyclical and partly by direct transmission.

"My view is that in the Igombe area, just before the appearance of the disease, both fly and game were numerous. The game, in particular, was plentiful in comparison with other parts of the Belt. In addition, there was a number of villages right in the Fly country. The game decreased in numbers as a result of various influences, especially during 1919, and at the same time the population was weakened by famine, influenza, and ankylostomes. The disappearance of the game buffer drove the fly on to man, who was no longer in a fit state to cope with the frequent injections of *T. brucei* which he now received from the tsetse, and eventually the trypanosome obtained a footing in man."

Interesting cases are those scattered through villages which lie well outside the bush, but the inhabitants of the villages are constantly entering the bush to visit their innumerable relatives and friends and also to cultivate a certain variety of millet which is said to require bush soil. Duke agrees with SWYNNERTON that infection in these cases is always traceable to contact with a previous case. The great majority of the cases were adults, both men and women, the disease being rare in young people below fifteen and exceedingly rare in children.

The spread of the trypanosome is effected by a *morsitans*-like tsetse [*G. swynnertoni*, Austen, 1923], and of the two alternative methods by which a trypanosome can be transmitted by Glossina, Duke has no doubt that, in the present epidemic, direct transmission is by far the more important. In support of this view are :—The predilection of the fly for man, the extraordinarily insanitary condition of the villages, the presence of numerous parasites in the peripheral blood, and the fact that there are many instances of two or more individuals living in the same hut at the same time becoming infected one after the other. The spread of the disease from place to place in the immediate wake of an infected visitor points unmistakeably to direct transmission as the method of spread. The presence of infected natives in the Nduha neighbourhood, where game is absent and where flies are in consequence feeding on man, has not caused any increase in the percentage of flies carrying the polymorphic trypanosome. The author records that he and a fly-boy were on August 16, 1922, bitten by a tsetse which they believe had escaped from a box of flies captured the previous day at Nduha ; this fly they recaptured, and on examining it found the gut and salivary glands swarming with trypanosomes and a number of freshly-imbibed blood corpuscles in the anterior part of the gut. This is the first record of a fly, cyclically infected with *T. brucei*, known to bite man without producing infection, in a region where the *rhodesiense* type of organism is found in man.

The wild-fly strain and the two human strains observed all formed posterior-nuclear forms in guinea-pigs, and the parasite belongs undoubtedly to the *brucei* group.

By dissection of wild-fly the author sought to obtain, first the "game index" of the fly—that is the percentage of insects carrying trypanosomes which, in the absence of domestic stock, must have come from the blood of game ; and, secondly, to discover the distribution of the polymorphic organism. In the table in which the results are summarized the observations are grouped into three classes :—*Class A*. Flies from localities where the inhabitants are heavily infected and game and fly are both present—the latter in

relatively large numbers; *Class B.* Flies from villages less heavily infected than in *A*; game scarce and fly not particularly numerous; *Class C.* Flies from places where there is game, but no people; fly fairly numerous. The figures show in a very striking manner that the presence of numerous human beings infected with "*T. rhodesiense*" is not correlated with an increase in the number of flies cyclically infected with the gut-and-gland trypanosome. The author writes:—

"It might be maintained that this percentage represents the utmost carrying capacity of wild *G. morsitans* for this group of trypanosomes. If this is the case, it is difficult to explain the situation in the Mwanza Fly-Belt save by ascribing the spread of the human strain to direct transmission.

"If *T. rhodesiense* and *T. brucei* are different species both carried cyclically by wild flies, surely the appearance of an epidemic in man would be reflected in the fly figures. Otherwise it behoves the sponsors of '*T. rhodesiense*' to include among its specific characters the entire reliance on direct transmission for its spread from man to man."

The infectivity of the game was examined by inoculating the blood from 16 of them into monkeys and by stained blood films. The blood of a roan showed a *T. vivax*-like organism, and the polymorphic *brucei* organism was recovered from the blood either of a waterbuck or a warthog, both animals having been tested on the same monkey.

The author summarizes his views on the aetiology of the epidemic as follows:—

"The ubiquitous *brucei* organism established a footing in man in 1919, or thereabouts. The conditions then obtaining were, for reasons already set forth, eminently favourable to the passage of the parasite from man to man by direct transmission.

"Cyclical transmission has played an entirely negligible part, if any, in the spread of the disease, and this for two reasons: first, the long submission of a strain to direct transmission tends to reduce its ability to survive in the fly; and, second, the newly-acquired physiological character of survival in man is lost directly the parasite is subjected to the controlling influences of the fly's interior.

"It follows logically from these conclusions that the main danger to be avoided is the presence of infected natives in communities exposed to the tsetse; and that the game, far from being a menace, serves as a valuable buffer between man and the fly.

"Experiments which are in progress at the Entebbe Laboratory promise further interesting information on direct transmission. I believe the time has now come for a comprehensive review of the position of man in relation to the mammalian trypanosomes of the African fly zones, and I propose to discuss the whole question at greater length in a paper which will appear shortly."

W. Yorke.

SWYNNERTON (C. F. M.). **The Entomological Aspects of an Outbreak of Sleeping Sickness near Mwanza, Tanganyika Territory.**—*Bull. Entom. Res.* 1923. Jan. Vol. 13. Pt. 3. pp. 317–370. With 6 plates, 1 text fig & 1 map.

Information volunteered by the native headman of Basheshi drew attention to an outbreak of sleeping sickness near Mwanza, and an investigation by MACLEAN showed that the disease was in fact trypanosomiasis. The author writes:—

"It was obviously an exceptional opportunity to gain some idea at first hand of the combination of factors necessary to bring about an outbreak of human trypanosomiasis in epidemic form before these should have been masked by remedial measures—particularly so if it should be

of Nyasaland type, and, in the event, furthermore, of *T. rhodesiense* and *T. brucei* being finally shown to be conspecific."

He was especially anxious, with a view to future policy, to gain a first-hand knowledge of the probable relationship of the game to such an outbreak, and consequently proceeded to Mwanza at the beginning of May, 1922.

The country generally, as regards vegetation, is divisible primarily into (1) perfectly, or nearly perfectly, open country free from tsetse, (2) acacia wooding, infested nearly throughout by a new tsetse of the *morsitans* group [*G. swynnertoni*, Austen, 1923], and (3) *Brachystegia*, savannah forest, also fly-infested. Details are given regarding these types of country. The population can be divided firstly into cattle-keeping cultivators who live relatively thickly in the cleared areas and who, when near enough, visit the woods for various purposes, and secondly into hunting and fishing cultivators who, owing to nagana, keep no cattle and who live in a more scattered manner in the woodland area itself. A detailed account of the distribution of game within the district follows. In certain areas, particularly to the north-east, it is particularly abundant, more south and west, in the woodland areas most closely associated with the outbreak of sleeping sickness, great game animals are exceedingly rare, and a third area, which comprises the closely settled country, is nearly destitute of game and avoided by it.

The paper next deals with the various tsetse flies found in the infected area and surrounding zones. *G. swynnertoni* was the only tsetse which could be found anywhere in the known infected area, notwithstanding a most thorough search, and is the fly referred to in the present paper. *G. palpalis*, *G. brevipalpis*, *G. fusca* and *G. pallidipes* are to be found mostly in comparatively small numbers in various places around the infected area. *G. morsitans* is, so far as the author knows, the only tsetse which exists on the densely infested *Brachystegia* area to the west of the infected district.

The following sections of the report deal with the seasonal distribution and preferences in vegetation of the fly, an apparent method of concentration, the feeding habits and sex proportions of the fly, and the following distance of female flies. With regard to the last of these points, the author saw followings of a mile and a quarter on walkers, and concludes that a barrier of a mile and a half, and probably very much more, would have to be cleared to obviate the likelihood of female flies crossing it even on natives. An experiment was devised with the object of determining the range of attack across cleared ground, and the following conclusions were reached from the somewhat incomplete experiment :—

"(1) That a clearing even of 70 yards on each side of a road would afford great protection when the grass is long, but is likely to be much less useful when it is short.

"(2) That the period of long grass is probably for the fly a period of relative difficulty in finding food-animals. Here we have some slight experimental confirmation of a point to which Fiske and Duke have drawn attention.

"(3) That both sexes of this tsetse range to some extent, flying to conspicuous objects such as isolated trees and (probably) rocks at a distance of not less than 80 yards in cleared country, perhaps much more. It follows from this that no trees, however clean-stemmed, must be left in a road-clearing. Also that the high, black-green euphorbia hedges that make the villages so conspicuous may be a disadvantage when the village is within one or two hundred yards of bush."

The various types of villages found in the sleeping-sickness area are described in some detail; they fall into three classes, (1) villages completely in the bush, (2) villages in a mbuga, *e.g.*, a more compact village of several huts, much clearer and less overgrown than the previous class and standing a quarter of a mile from the bush in an open grassy mbuga, (3) villages in cleared and closely settled country.

Regarding the date of origin of the epidemic, the author believes that it probably started five or six years ago, and he notes that BALFOUR told him that he had found on April 2, 1918, unusual numbers of trypanosomes in a slide made from the blood of a patient from Usmao who had died shortly before. It was always easy to trace a sequence between any case and preceding cases. Going to see the sick and taking the sick in seem to have been the commonest sources of infection recognized by the natives. An exceptional number of cases occurred along the margins of populated areas, no doubt chiefly because it was here that the largest number of people were in contact with the fly, but it may well have been due also to the fact that game was scarcest there and the fly most dependent on man. There was no indication of new and independent infections; every case appeared traceable to contact with sick persons in the presence of tsetses. Man seemed now the sole reservoir, however the first infection arose.

With reference to the conditions under which tsetse of the *morsitans* group concentrated on man, the author states that observations here and elsewhere in the territory show that concentrations on man are caused by the relative absence of game and by nothing else. With game absent they take place in villages, along paths, on travelling parties, and at the more suitable patches of bush crossed by the paths, water-holes, streams, and particular thickets and vleis. In game country concentrations do not take place, except very temporarily or incompletely. Whatever small part may be played by the game, the author is of opinion that it is impossible to regard man as other than the chief or only reservoir in any human trypanosome infection. Sick natives spend most of their time outside the huts with healthy people working or idling around them. People drop in from neighbouring villages. The habit of stopping to exchange news—indulged in always, even on the open road—is one main factor. A second is the beer-drink, which, in great part, takes place outside the huts and in the day-time. A third meeting place is the water-hole. A fourth important factor is the caravans, and a fifth, important only on lakes and large rivers, and not concerning, as a rule, the flies of the *morsitans* group, the canoes and landing-places. Finally, there are such occupations as hoeing and threshing. People who are not very sick take part in the ordinary occupations of the community, and even the very sick lie outside near other members of the community. Famine vastly increases contact, both within a given area and as between that area and those surrounding it.

The next section deals with the relation of the game to the outbreak. The author considers this subject firstly on the hypothesis that the parasite is *T. gambiense*, and secondly, that it is *T. rhodesiense* [Duke has actually shown that it is *T. rhodesiense*, see p. 309]. On the latter assumption, the epidemic may have arisen in three ways: (*a*) it may have been introduced from outside by the movements of man in the war; (*b*) the parasite may have been present all the time as a specific trypanosome pathogenic to man, or (*c*) it may simply be a strain arising from *T. brucei* of game. The author expresses no opinion as to which of these theories is correct.

He goes on to consider what has caused the infection to grow into an epidemic in this particular place. He refers to DUKE's theory that direct transmission may play the all-important part in producing and maintaining an epidemic, and refers to his own observation that the human population in this direction was being specially and continuously attacked by Glossina as a result of previous destruction of game. Game destruction and special attacks on man have, however, taken place locally in parts of the territory in which, so far as we know, no outbreak of human trypanosomiasis has followed. Sleeping sickness was first noted at the end of the famine, and it is probable (*a*) that a trypanosome actually or potentially pathogenic to man had been introduced from one of the sources mentioned above, (*b*) that famine and hardships had lowered the resistance of the population, (*c*) that out of several localities in which this trypanosome was present and might have caused trouble had it not been for the fly-diverting, virulence-controlling presence of game, it did actually first spread and establish its full virulence in one of them.

Density of fly is not in itself a cause and density of population is unessential. It is continuous density of fly in relation to man and ready feeding that matter, and these depend entirely on the presence or absence of game.

Dealing with the question of the possibilities of spread, Swynnerton writes as follows :—

"Tsetses alone are unlikely to spread the disease far, even if it is propagated through cyclical transmission, owing to the considerable breadth of the barrier round the main Usukuma belt. Game, on present evidence, does not seem likely to spread it, and I know at present of no great movement of game between the main Usukuma belt and the tsetse belts about it. But an infected man going out, passing through or having entered for one of the many purposes I have enumerated, may subsequently sit down and talk in a village or road-side halt in any tsetse belt in the territory, in a locality in which man is for the time being the centre of attraction for the tsetses that he was in the Simiyu area during our visit, and start a case or two or an epidemic. It is improbable that the last will come about in any place about which game is present abundantly."

The rest of the paper is concerned with various measures which are commended for dealing with the situation. The paper is illustrated by an excellent map.

[It is difficult to deal with a lengthy paper of this sort in an adequate manner in a summary of moderate length, and the report, which is of great interest, should be consulted in the original.]

W. Y.

BOYÉ. **Fonctionnement technique des secteurs de prophylaxie de la maladie du sommeil dans l'Afrique équatoriale française pendant l'année 1921.**—*Ann. de Méd. et de Pharm. Colon.* Paris. 1922. May–June–July–Aug. Vol. 20. No. 2. pp. 194–216.

The author summarizes the sleeping sickness work done during 1921 in French Equatorial Africa. The various divisions into which the Colony has been divided are dealt with separately, and in a series of tables the number of persons examined in each sub-district, or group of villages, is given, together with the number found to be infected. In the Haut-Chari division 101,195 persons were examined and 2,717 old cases and 1,801 new cases of the disease found ; the percentage infected was 4·4 and the number of deaths during the year was 429.

In the Ibenga-Motaba division, comprising a population of about 30,000 persons, 2,103 old cases and 893 new cases were discovered. In the Fort-Archambault division 227,772 persons were examined and 11,013 old cases and 1,605 new cases met with; in Djoué-Loudima division 44,606 persons were examined and 113 old cases and 688 new cases found. In the Ouham-Pende-Fafa division 46,845 persons were examined and 477 cases of the disease found; this division has come under the investigation of the Commission only since June, 1921. In Loango-Loudima division, which has been dealt with for the first time during the year in question, 13,186 persons were examined and 1,180 found to be infected. The Haut M'Bomou division was taken over by the Commission for the first time in June, 1921; 16,875 persons were examined and 2,476 found to be infected. The division of Ogooué-Bongo was examined for the first time in May, 1921; 16,953 natives were examined and 209 cases of the disease discovered. The Haut-Ogooué division is still unexplored from the point of view of sleeping sickness, but was visited in December, 1920, and in January and February, 1921. According to the natives, trypanosomiasis had made its appearance three or four years previously; in various tribes the infection varied from 10 to 50 per cent. of the population. The division came under the control of the Commission in May, 1921, but has not recently been investigated; only 4,300 persons have so far been examined and 900 cases found. In the division allotted to the Institut Pasteur of Brazzaville, 31,603 persons (including 532 Europeans) were examined and 383 old cases (including 1 European) and 474 new cases (including 1 European) were discovered. The last division is that under the Libreville laboratory, which has been established since April, 1920. Details of the work of this laboratory are given by SICÉ [see below].

In all, the sleeping sickness prophylactic service of the Colony has, during 1921, examined 559,658 persons, and 18,800 old cases and 9,789 new cases were found and treated. The total number of cases is thus 28,589, *i.e.*, 5·1 per cent. of the persons examined. All the patients have been given two to five injections of atoxyl and some of them more.

W. Y.

SICÉ (A.). **La trypanosomiase humaine au Gabon. Organisation du laboratoire et de la station de traitement des trypanosomés de Libreville.**—*Ann. de Méd. et de Pharm. Colon.* Paris. 1922. May–June–July–Aug. Vol. 20. No. 2. pp. 151–158. With 1 map.

In this paper the author describes the sleeping sickness campaign recently undertaken in Gabon. The laboratory was opened in the early part of the year 1920, and the first investigations concerned themselves with an examination of the native population around Libreville. The people belong to the M'Pongwée tribe; 314 men, 582 women and 856 children were examined, and less than 2 per cent. were found to be infected. Having obtained this information, the investigation was extended to the surrounding districts. Of the inhabitants of the basin of the Congo, comprising about 5,000 persons, 1,619 men, 2,013 women and 984 children were examined, and about 2 per cent. found to be infected. The population of the Ogooué basin is about 3,500, and of these 960 men, 1,001 women and 305 children

were examined, and 4·07 per cent. found to be infected. About 3,400 persons inhabit the banks of the Kango and its tributaries, and of 2,454 examined 3·07 per cent. were infected. In the villages on the banks of the Temboni and Noya and their tributaries to the north of Libreville, 1,360 men, 1,730 women and 744 children were examined, but only 0·78 per cent. were infected.

In all, during 1920 and 1921, a total of 17,756 persons inhabiting the villages of the basins of the Coma and Muni were examined and 429 cases of sleeping sickness found. Details are given of the administrative measures adopted.

The paper is illustrated by a map, but it has been so reduced in reproduction that most of the names are illegible, and the map is consequently of little use to the reader.

W. Y.

JOJOT (Ch.). **Prophylaxie de la maladie du sommeil au Cameroun en 1920 et 1921.**—*Bull. Soc. Path. Exot.* 1922. Nov. 8. Vol. 15. No. 9. pp. 830–833. With 1 map.

The author describes the measures adopted against sleeping sickness during 1920–21, in the Haut Nyong division of the Cameroons. This district occupies an intermediate position between those of equatorial Africa to the south where the disease is epidemic and those to the north where it is sporadic. The division is for administrative purposes divided into three districts, viz., those of Akonolinga, of Abong M'Bang and of Doumé. Between January, 1920, and March, 1922, the three districts were examined, with the following results:—In Akonolinga, with a population of 43,930 persons, 5,615 (12 per cent.) were found to be infected; in M'Bang, of 22,165 persons, 841 (3 per cent.) were infected; and in Doumé, of 61,986 persons, 2,092 (3 per cent.) were infected. It is estimated that the total number of cases is about 10,000. All the infected were given a tally, a duplicate being deposited at the issuing office; they have been atoxylized to the extent of 0·5 gm every six days up to a total dose of 7·5 gm. The treatment was then suspended, the patient re-examined after a month, and treatment again given according to the result of the re-examination. Details are given regarding the cost of the work.

W. Y.

VELHO (Luis Baptista de Assunção). **A tripanossomose em Angola.** [Trypanosomiasis in Angola.]—*Rev. Méd. de Angola.* 1921. Nov. No. 2. pp. 7–196. With 1 map.

The first section of this paper contains a general review of human trypanosomiasis in Africa—its history, treatment, and causative agents.

The Commission had three aims in view: (1) destruction of tsetse flies; (2) treatment of infected persons; (3) protection of the non-infected. The last two objects were greatly assisted by a decree in the Belgian Congo to the effect that everyone leaving the district, irrespective of race or sex, has to submit to a medical examination for trypanosomes. Those found infected are treated and the uninfected are given a certificate. The whole population is thus examined from time to time, and anyone not in possession of a certificate (unless under treatment) is liable to be punished.

The second section is devoted to an account of the work of the Mission sent out to investigate the question of trypanosomiasis in

Angola and to institute a campaign against the disease. This work was carried out in Benguella, Dombe Grande, Lobito and Catambela. A detailed account follows, in the nature of a monthly record of the places visited, the prevalence in them of sleeping sickness, the numbers of tsetse flies found, the areas of bush cleared, the establishment of medical stations for treatment, the cost of operations, and so forth, from August, 1916, to August, 1918. Sleeping sickness is shown on the map as existing at Benguella, Lobito and Egito, all on the coast.

The third and last section gives an account of the actual campaign. This begins with a lament that where so much was expected and hoped for so little could actually be accomplished owing to the scarcity of workers. In the zone Benguella to Lobito segregation camps were established in July, 1918, for the reception of patients and their treatment by atoxyl. By the end of the following year 5,000 hectares of land had been cleared, and in a little over six months nearly 60,000 flies had been captured. As regards other districts no actual figures are mentioned, the report merely furnishing general statements as to the treatment of patients and clearing of bush.

Destruction of pupae was found to be much more arduous than the members of the expedition expected, since they were met with mostly in small tufa masses of entangled bush and climbing plants along the edges of streams, although in some instances pupae of *G. palpalis* were found 100 metres away from any water.

The report gives ample evidence of strenuous work carried out under adverse conditions, but ends undauntedly by expressing hopes of greater success in the future.

H. Harold Scott.

MACKENZIE (A. J.). **Case of Trypanosomiasis.**—*Ann. Trop. Med. & Parasit.* 1922. Dec. 30. Vol. 16. No. 4. pp. 457–458. With 2 charts.

An account is given of a case of sleeping sickness in a young European woman about 18 years of age. The infection was contracted in the Sebungwe district of Southern Rhodesia in August, 1919. The infection, which was resistant to galyl, soamin and tartar emetic, ran a rapidly fatal course, and the patient died on December 9, 1919. On inoculation of the blood into a rabbit, the infection was shown to be *T. rhodesiense*. The case appears to be of special interest in the following points :—

1. Trypanosomes in the blood of the patient were very numerous and posterior nuclear forms were found among them.

2. In November the patient developed keratitis in both eyes, and within a fortnight became almost completely blind.

[So far as the reviewer is aware, posterior nuclear forms have never been found before in human blood, nor has interstitial keratitis been observed in human beings suffering from trypanosomiasis.]

W. Y.

KLEINE (F. K.) & FISCHER (W.). **Bericht über die Prüfung von "Bayer 205" in Afrika.** [Report on the Use of "Bayer 205" in Africa.]—*Deut. Med. Woch.* 1922. Dec. 22. Vol. 48. No. 51 pp. 1693–1696.

The observations recorded in this report, which is dated May 20, 1922, were made in the vicinity of Ndombo, about 50 miles north of Mpika, in North-Eastern Rhodesia—a region in which numerous *Glossina morsitans* are found.

The authors had three main objects in view: (1) to test the value of the drug on cases of sleeping sickness in man; (2) to test its value on trypanosomiasis of cattle; and (3) to examine its value as a prophylactic. They further decided to ascertain whether infected tsetse flies would lose their infection when fed repeatedly on animals treated with "Bayer 205," and if this were not the case, whether the development of the infection in flies in which it had already begun would be interrupted by feeding on treated animals, so that the insects did not become infective.

There exist in Africa many regions rendered useless for cattle rearing solely from the fact that they are surrounded by "fly belts," so that it is impossible to introduce animals to improve the breed or to remove them for sale. In this case it is only necessary to be in a position to protect the animals for a given period. The authors recall that some time ago they drove five donkeys from Lake Victoria through a fly belt to Tanganyika; three of the animals were given daily arsenic in the food, the others served as controls. On arriving at Tanganyika none had become infected; consequently the experiment was prolonged in a fly belt, with the result that all became infected. From this it follows that arsenic in the doses used by the authors is not an efficient prophylactic, and, further, that animals which traverse a fly belt without becoming infected are not for that reason necessarily protected against nagana, but are fortuitously bitten by no infective fly.

In order to test accurately the prophylactic value of "Bayer 205," it would be necessary to use many treated animals and many controls, and such an experiment was not possible—apart from the cost—owing to the general absence of cattle in the tsetse region. Instead, therefore, of driving their experimental animals—donkeys, cattle, dogs, goats, etc.—into a fly belt, the authors decided to feed on them many hundreds of captured *G. morsitans*, thus rendering the occurrence of infection independent of the element of chance. By this method few animals were needed, and it was possible to study more exactly the duration of the protective action of the drug. The therapy experiments were conducted in a similar manner, *i.e.*, on animals infected by the bites of captured Glossina.

As the tsetse fly experiments consumed much time, numerous preliminary and complementary experiments were performed in which the animals were infected not from tsetse, but by inoculation of the blood of naturally infected animals or strains which had passed through but few vertebrate hosts. The biological characters of such strains, the authors hold, are not changed as are those preserved for prolonged periods by passage through vertebrates in European laboratories. The parasites used were *T. brucei*, *T. rhodesiense*, *T. bovis* (perhaps identical with *T. vivax* and *T. cazalboui*) and *T. caprae*. The authors remark that *T. brucei* is the cause of nagana and *T. rhodesiense* the cause of human disease, and that up to the present, in view of TAUTE's work, they cannot consider them identical.

In their experiments the authors used chiefly monkeys (*Cercopith. rufov.*), which are extremely susceptible to *T. rhodesiense* and *T. brucei*, but which in nature are practically never found to be infected except in regions where tsetse swarms.

Experiments on monkeys.

It was found that after early administration of 0·25 gm. of "Bayer 205," trypanosomes disappeared from the blood within 48 hours. Sometimes a single dose resulted in a definite cure. Of seven monkeys

which received the above dose on each of two consecutive days, a relapse occurred in three cases; of seven others which received the same dose on three or four successive days, no relapse was observed within an observation period of four months. Equally successful results were obtained by subcutaneous injection of 0·05 to 0·15 gm. Twenty-seven monkeys were thus treated, and three of them which had been infected some time and the blood of which contained numerous trypanosomes died the day after injection, a result which the authors attributed to toxaemia from destroyed trypanosomes.

The prophylactic action of an oral dose of 0·25 gm. is short, not lasting more than two days; that of a similar dose on each of two consecutive days lasts, as a rule, about four days. Naturally, the length of the protection depends also on the body weight of the animal. For practical purposes the protection is too short; for example, one monkey on which, in the course of 14 days, 480 flies were fed, became infected, although it received 0·25 gm. of the drug orally on each of four successive days before the feeding began, and a similar dose on each fourth day during the experiment. Another similar experiment gave the same results.

After the subcutaneous administration of 0·15 gm. of the drug, 854 flies were fed on a monkey between January 25 and February 3 without infection resulting. The Glossina were first fed for two days on a dog and then for two days on the treated animal, and then for two days on a second monkey; the experiment was stopped as soon as the dog and the second monkey became infected, thus ensuring that an infected fly was among those used. In later experiments only one control was used, the flies being first fed on the treated animal and then on the control. The protection resulting from subcutaneous injection of the drug is of considerable length, one monkey not being infected by the bites of 276 flies a month after treatment, and a second not being infected by 270 flies two months after treatment.

Similar observations are being made with virulent blood.

This extraordinary difference between oral and subcutaneous administration of the drug the authors explain on the hypothesis that after subcutaneous administration the drug forms a depot and is only gradually brought into action. In therapy care will have to be taken that this depot formation does not result in damage to the internal organs (fatty degeneration of the liver, nephritis and haemorrhage from the intestinal mucous membranes).

Monkeys which, on account of an oral dose of "Bayer 205," are protected against *T. rhodesiense* or *T. brucei* for a few days exhibit a relative immunity to later inoculations of the same, or different, trypanosomes. Up to the present, eight monkeys, during a period of three months, have received several injections of infective blood; two became ill after the third injection and four after the fourth, the remaining animal is still healthy. This is due to an active immunity resulting from the overcoming of a slight injection. The authors consider it very doubtful whether such relative immunity has any practical significance for the campaign against trypanosome diseases, *e.g.*, nagana in cattle.

Experiments are recorded which suggest that the trypanosomes may become accustomed to the drug. Two monkeys which had relapsed after administration of 0·25 gm. orally were given a course of treatment consisting of 0·2 gm. orally on each of four successive days—a treatment which had previously never failed; both animals, however, relapsed after a short period.

Experiments on cattle.

The next portion of the report deals with experiments on cattle. For subcutaneous administration 2–3 gm. of the drug were dissolved in 20 cc. of physiological salt solution and the injection was made under the skin close to the vertebral column. Sometimes an oedematous swelling was noted, but abscesses did not occur.

A Glossina-infected small ox was given subcutaneously, from April 5–7, 7·5 gm. of "Bayer 205" in doses of 2·5 gm. From April 23 onwards its blood was injected into monkeys every 14 days in order to see whether it was free from *T. brucei*; the monkey inoculated on May 8 became infected. Another Glossina-infected small ox received 12 gm. of "Bayer 205" in doses of 2–3 gm. between March 8 and 24; the monkey inoculated from it on April 28 became infected. A third similarly infected small ox was given 14 gm. between March 14 and 25, in doses of 2–3 gm. Up to the time of writing, none of the sub-inoculated monkeys had become infected.

A description of a number of prophylactic experiments follows:—Two small oxen were given orally, from February 1–4, daily doses of 5 gm. (total 20 gm.): on February 6 they were inoculated from a tsetse-infected dog; and on February 9 and 10, and also on February 15 and 16, they were given further 5 gm. doses of the drug: both animals became infected.

A calf was given, on January 10, 5 gm. of the drug subcutaneously, and 14 days later inoculated with the blood of a tsetse-infected dog: the animal remained healthy. The same calf was later, on March 11 and 12, given daily 2 gm. of the drug subcutaneously; from April 12–19, 852 Glossina were fed on it; on May 1 its blood infected a monkey. An ox was given subcutaneously 2 gm. on March 12 and 14, and 3 gm on March 21 and 22—in all 10 gm. of the drug; in the intermediate period, March 14–22, 756 tsetse were fed on it: the control dog became infected, but none of the monkeys inoculated from the ox has yet become infected. Another ox received 2 gm. on March 12 and 14, and 3 gm. on March 21 and 22—in all 10 gm. of the drug; from March 22 to April 2, 648 flies were fed on it; the control dog became infected but none of the subinoculated monkeys. On May 12 the ox suddenly died from unknown cause; 30 cc. of its blood inoculated into four monkeys did not produce infection.

From these few therapeutic experiments it appears that cattle are not so easily cured as monkeys; the hope that cattle can be successfully treated by a few moderately large doses following shortly on one another seems to be but slight. It is intended to determine the effects of longer courses of treatment. The authors remark that, although in the prophylactic experiments the two oxen which received large doses of the drug shortly before infected fly were fed on them have, so far, remained healthy, it is quite possible that an infection has actually occurred and is only prevented from developing by the presence of the drug; further subinoculations will decide this.

The next portion of the report relates to trypanosomes, other than *T. brucei*, found in cattle. A parasite similar to *T. bovis* was found in the blood of a number of treated animals. Possibly this is identical with *T. vivax*, but it differs in certain respects from ZEEMANN's description of the latter. This trypanosome reacts to "Bayer 205" differently from *T. brucei* and *T. rhodesiense*; in eight cases it disappeared from the blood for at most nine days after the usual dose of the drug. Its development [like that of *T. vivax*] in Glossina takes place entirely

in the proboscis. Details of two experiments on goats are given which indicate that *T. caprae*—a common parasite of goats and sheep [resembling closely *T. vivax*]—is likewise relatively resistant to the action of the drug.

Regarding the question whether Glossina which have been fed on an animal previously treated with "Bayer 205" lose their infectivity, the authors point out that certain of the experiments already described show that this is not the case: this is not surprising considering that the infective stage of *T. gambiense*, *T. rhodesiense* and *T. brucei* is in the salivary glands. The further question, however, is whether the intestinal development is influenced. The solution of this problem has, as yet, not been obtained, as it will involve the use of many laboratory-bred flies.

The final section of the report deals with the treatment of sleeping sickness in human beings. So far only six cases, found by KINGHORN, are available, but others will be sought in the Lundazi district. Details of the cases treated are as follows:—

1. A European (F. M.), 48 years old, became ill on December 10, 1921, and was first seen by the authors on January 14, 1922: the blood contained numerous trypanosomes, but there was no glandular enlargement. "Bayer 205," 1 gm., was given by the mouth on January 14, and 1 gm. morning and evening on January 15 and 16. On January 17 the trypanosomes had disappeared from the blood: the patient was given 1·2 gm. intravenously: on January 19 the urine contained a trace of albumen, but no casts: on January 24, 1 gm. of the drug was given intravenously. The patient rapidly improved, the temperature was normal, and the urine free from albumen. The patient left the camp on January 27, and after a further 14 days was given another 2 gm. of the drug. Whether a relapse has occurred is as yet unknown.

2. Pitala, ♂, aged 26, was brought to the camp on February 20 in a very weak condition; he had irregular fever, and numerous trypanosomes were found in the blood. On February 21 he was given 1 gm. of the drug orally, and on February 22 and 23, 2 gm. orally: trypanosomes did not disappear completely from the blood. On February 28 and March 3, 0·5 gm. was given subcutaneously: trypanosomes disappeared but were found again on March 18. On March 20, 1 gm. was given subcutaneously; on March 23, 1·5 gm.; and on April 8, 1 gm.: the trypanosomes disappeared on, and have not reappeared since, March 21. On March 24 albuminuria developed, but no casts were seen: the weight had increased, and the general condition so greatly improved that on April 29 the patient was, at his request, given work at the camp.

3. Yatula, ♀ aged 30, who had been ill since November, 1921, came to the camp with the previous case and was treated orally in a similar way, with the result that trypanosomes disappeared from the blood for five days. From March 2–4, 0·5 gm. of the drug was given subcutaneously; on March 21, 1·2 gm.; and on March 24, 1·5 gm. was again given subcutaneously. Since February 24 there had been albuminuria, but no casts. The blood has been free from trypanosomes and the patient completely well since March 3.

4. Chimuwira, ♂, aged 40, had been ill, according to KINGHORN, from November, 1920; there was some enlargement of the lymphatics. On March 24 and 27 he was given 1·5 gm. of "Bayer 205" subcutaneously: albuminuria has been present since April 5. Since March 25 the blood has been free from trypanosomes, the enlargement of the glands has disappeared, and the patient looks well: he was taken on as a worker at the camp on May 1.

5. Iseke, ♂, aged 15, was very ill and could hardly walk when he came to the camp: there was slight ascites and a trace of albumen in the urine; pulse 127. On March 25 he had 1·5 gm. subcutaneously, and on March 29 and April 14, 1 gm. subcutaneously. There was a rapid and marked improvement; the urine still contains traces of albumen. Trypanosomes have been absent from the blood since March 26, and on May 1 the patient was given work at the camp.

6. Chizilicho, ♂, aged 24, had been ill since September, 1921. The cervical glands were enlarged and the appearance was apathetic. On May 10 and 16, 1·5 gm. of "Bayer 205" was given subcutaneously: there was a marked febrile reaction and albuminuria developed. Even by March 16 the lymphatic glands had shrunken, and since May 11 the blood has been negative. In view of the severity of the case another injection of 1·5 gm. was given during the first part of June.

The authors recommend that in the treatment of sleeping sickness two or three additional injections of 1–1·5 gm. should be given at long intervals. Smaller doses are to be avoided for fear they should result in the production of drug-fast strains.

In conclusion the authors state that "Bayer 205" exerts a pronounced influence on those trypanosomes of man and stock which undergo their final development in the salivary glands of Glossina; the intensity of the action varies with the trypanosome strain, but especially with the vertebrate host.

W. Y.

Kleine (F. K.) & Fischer (W.). [**Further Experiences with the Use of "Bayer 205."**] [MSS. received from Colonial Office.]

Of the six patients referred to in the previous report, five are still in excellent health, with the urine free from albumen, whilst the sixth—the European who had only two intravenous injections—has relapsed.

At the end of June, 1922, the treatment of 30 other cases was begun; 16 of them were gravely ill (marked somnolence and inability to walk). All were given an injection of "Bayer 205" as soon as they were discovered and then conveyed to the camp, some ten days' journey away. An old woman died of pneumonia and a middle-aged man died suddenly from unknown cause seven days after the fourth injection. The remaining cases showed within a few weeks such an amelioration as to call to mind "Biblical cures." The blood has remained free from trypanosomes. At the end of August lumbar punctures were made in 19 cases (nine previously severely affected, five of medium severity, and five slightly affected), and isolated trypanosomes were found in seven of them. In all cases in which trypanosomes were found the individuals had severe nervous symptoms at the beginning of treatment. These symptoms have almost entirely disappeared, a sign that "Bayer 205" is not without effect on the parasites in the brain. In October lumbar punctures were again made in four of the above positive cases and trypanosomes found in three of them; the patients seemed well, however, and were able to do heavy work. It is assumed that trypanosomes undergo a great decrease of virulence in those parts of the body where they are not entirely destroyed by the drug. Experimental work with cattle and monkeys seems to support this hypothesis.

The routine method of treatment adopted is as follows :—

A subcutaneous injection of 1·2 gm. of the drug in 5 cc. of warm physiological saline is given near the spine between the shoulder blades ; the injection is repeated after an interval of 10 days, and again after a further 18 days. Abscesses did not occur. It is proposed to use intravenous injections in cases where the parasites do not disappear from the cerebrospinal fluid.

The authors point out that the results appear less favourable than they really are, because, owing to the objection of the native to lumbar puncture, this was not performed in the case of patients "whose excellent state of health or independent nature caused us to fear their sudden departure."

In conclusion Kleine and Fischer state that they are not particularly satisfied with the results hitherto obtained by them in the prophylaxis and therapy of infected cattle ; they are not comparable with those achieved in sleeping sickness. The alteration of virulence caused by "Bayer 205" makes it possible, however, that treated cattle may be healthy clinically, even though they still actually harbour trypanosomes.

W. Y.

Low (George C.) & Manson-Bahr (Philip). **Preliminary Note on the Therapeutic Action of Bayer "205" in Nine Cases of Human Trypanosomiasis.**—*Lancet.* 1922. Dec. 16. pp. 1265–1267.

A record is given of nine cases of sleeping sickness (eight of *T. gambiense* and one of *T. rhodesiense*) treated with "Bayer 205." One of the cases died of cerebral trypanosomiasis, seven are now in good health and apparently cured, while in the last, the Rhodesian case, though greatly improved after massive injections of the drug, the result may be said to be inconclusive.

The following suggestions are put forward with reference to the administration of the drug :—

"(1) The injection is best made intravenously in the dose of 1 g. at a time, but it may also be given with safety by the subcutaneous route ; it has been suggested, too, that in cases of cerebral involvement it may be injected intrathecally. (2) The individual dose should be 1 g. at a time in a 10 per cent. solution, but we have also given it with apparent safety in 2 g. doses in a 20 per cent. solution. (3) In order to kill off all the trypanosomes more than one or two injections of the drug are necessary ; these should be given at stated intervals—once a week ; sometimes it appears that 10 are sufficient, but this cannot be taken as an invariable rule ; much seems to depend upon the severity of the infection, and, it may be, upon the location of the trypanosomes in the body. At any rate, the rôle of this drug in the treatment of sleeping sickness may be analogous to that of salvarsan in syphilis, in which disease it is now well recognized that it is quite impossible to forecast how many injections are necessary to eradicate a given infection ; more especially is this the case when the spirochaete has invaded the central nervous system. It will be readily understood, therefore, that "205" may fail to act in the same manner when the trypanosomes have invaded the brain substance. (4) It is probably more scientific to attempt a "*therapia magna sterilisans*" by giving the first three injections on three consecutive days. (5) Further experience is required with reference to the cumulative action of this drug in man ; its selective action upon the specialized renal epithelium requires explanation."

The opinion is expressed that "Bayer 205," although not infallible, is by far the most powerful trypanocidal substance hitherto employed.

The ideal aimed at—a *therapia sterilisans magna* resulting from one massive injection, and which HAENDEL and JOETTEN and others obtained by treating rats with "Bayer 205"—has not, so far, resulted in man, at any rate not in the cases under the authors' charge.

W. Y.

STEPHENS (J. W. W.) & YORKE (W.). **A Case of Sleeping Sickness** (*T. gambiense*) **treated by "Bayer 205."**—*Ann. Trop. Med. & Parasit.* 1922. Dec. 30. Vol. 16. No. 4. pp. 421–424.

Details are given of the treatment of a case of sleeping sickness contracted at Wamba, N. Nigeria, in August, 1921. The disease had remained untreated until the patient's arrival in Liverpool in March, 1922. Two injections of atoxyl and two of novarsenobillon were given, with the result that the general condition of the patient rapidly improved. A relapse, however, occurred in May, and the patient was then treated with "Bayer 205"—0·5 gm. on May 30, 1 gm. on June 1, and 1·5 gm. on June 3. All symptoms rapidly disappeared and the blood became negative. On June 27 a further injection of 1 gm. was given as a "prophylactic" measure. The patient has remained well and the blood negative up to the time of writing, November 20, 1922.

W. Y.

MENK (W.). **Zur Behandlung der afrikanischen Schlafkrankheit mit "Bayer 205."** [The Treatment of African Sleeping Sickness by "Bayer 205."]—*Muench. Med. Woch.* 1923. Jan. 5. Vol. 70. No. 1. pp. 18–19.

The patient (K. F.) contracted sleeping sickness in Portuguese Africa, and trypanosomes were first found on August 12, 1922. Up to the time of his arrival at Hamburg, he had received only a couple of injections of atoxyl. On examination at Hamburg, the general condition was miserable, there was marked pulmonary tuberculosis, considerable adenitis, enlargement of the spleen and anaemia, and numerous trypanosomes were found in the blood. "Bayer 205" was given intravenously as follows: September 26, 0·5 gm.; September 27 and 28, 1 gm.; October 4, October 12 and October 25, 1 gm.; *i.e.*, 5·5 gm. of the drug in a month. This treatment was well tolerated; it was followed by slight albuminuria, but no oedema; the first two injections were, however, followed by a considerable febrile reaction. Trypanosomes speedily disappeared from the blood, and the temperature became normal. Twelve days later the temperature rose again and *P. falciparum* was found in the blood; the malaria was treated by quinine, the parasites soon disappeared, and the spleen quickly diminished in size.

In order to ascertain whether "Bayer 205" appeared in the cerebrospinal fluid, a lumbar puncture was made 36 hours after the third injection. The fluid was normal in appearance and did not contain trypanosomes; the presence of the drug in it could, however, not be demonstrated, as the fluid exerted no therapeutic effect on caderas mice. The author is consequently of opinion that intralumbar injection of the drug is indicated in cases where the spinal fluid is invaded.

W. Y.

MAYER (Martin). **Ueber das neue Trypanosomenheilmittel "Bayer 205" und seine Bedeutung für die chemotherapeutische Forschung.** [The New Trypanosomiasis Remedy, "Bayer 205," and its Significance for Chemotherapeutic Research.]—*Deut. Med. Woch.* 1922. Oct. 6. Vol. 48. No. 40. pp. 1335–1337.

In this address Mayer summarizes the work which has so far been done on the treatment of trypanosome diseases of man and stock by "Bayer 205." It contains nothing which has not already been noted in this *Bulletin*.

W. Y.

HESSELBACH (Kurt). **Die trypanozide Wirkung von Bayer 205 auf** *Trypanosoma equiperdum.* [The Trypanocidal Action of "Bayer 205" on *T. equiperdum.*]—*Cent. f. Bakt.* 1 Abt. Orig. 1922. Nov. 18. Vol. 89. No. 4–5. pp. 48–71. With 1 plate & 1 text fig.

The experiments described in this paper are of three kinds, viz. :—

1. Experiments performed with the object of ascertaining the action of "Bayer 205" on *T. equiperdum, in vitro.*

2. Therapeutic experiments on guinea-pigs infected with *T. equiperdum.* Four animals of approximately equal weight (about 300 gm.) received respectively 0·02 gm., 0·04 gm., 0·06 gm. and 0·08 gm. of the drug, and the condition of the parasites was studied in fresh and stained blood preparations made at half-hourly intervals.

3. Prophylactic experiments on guinea-pigs previously treated with the drug. Four animals of about the same weight were given 0·04 gm. of the drug and were inoculated intraperitoneally with *T. equiperdum,* respectively, 1, 3, 6 and 10 days later. The condition of the parasites in the peritoneal cavity was studied at hourly intervals, a drop of peritoneal fluid being withdrawn for the purpose by means of a capillary tube.

The harmful action of "Bayer 205" on trypanosomes *in vitro* is seen especially in high concentrations. With 1 per cent. solutions it is slight, in 2–5 per cent. concentrations it is quite definite, whilst with 10 per cent. solutions the trypanosomes are rendered motionless within five minutes. These results have an application for the treatment of large animals, and suggest that for this purpose as large doses as possible should be employed.

In the therapeutic experiments the deleterious effect of the drug is first manifest by a sort of stimulant action ; the parasites commence to divide, but the process is not completed. Frequently parasites are seen with double blepharoplasts, but there is rarely division of the nucleus, and still less rarely of the cytoplasm ; the drug interrupts the biological processes of the parasites.

The corresponding morphological changes can be studied in Giemsa-stained preparations, and consist in profound degenerative changes in the parasites. The nucleus appears completely structureless, and in advanced degenerative stages completely destroyed, its chromatin constituent being scattered through the entire body of the trypanosome. In therapeutic experiments it is found that these changes increase with the concentration of the solutions used. Finally, the changes affect the whole body of the parasite ; the flagellum is paralysed, the undulating membrane exhibits changes, the trypanosome swells and finally disintegrates.

None of the guinea-pigs previously treated with "Bayer 205" became infected.

The changes seen in the parasites were different from those observed in the therapeutic experiments. The trypanolytic changes set in immediately and were not preceded by the biological stimulation indicated by increased divisional activity. The parasites became narrower instead of swelling, the movement of the flagellum and undulating membrane became modified, the parasites trembling or quivering. Later, the trypanocidal changes became more marked, the parasites swelled, the flagellum was lost, and finally disintegration occurred.

W. Y.

MIGONE (L. E.) & OSUNA (T.). **Behandlung des "Mal de caderas" der Pferde mit dem neuen Mittel "Bayer 205."** [Treatment of Mal de Caderas of Horses with "Bayer 205."]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1922. Nov. Vol. 26. No. 10. pp. 289–304.

In this paper the authors record the effect of treating with "Bayer 205" a large number of horses suffering from mal de caderas. In almost every case the result was successful. In other cases the drug was used as a prophylactic agent, and here again the experiments were attended with a great measure of success, although the observations have not been sufficiently extended to determine the length of time for which a dose of the drug will afford protection.

It was found better to administer the drug intravenously than subcutaneously, as the latter method gave rise to inflammatory changes. The curative course consisted of three injections of respectively 2 gm., 3 gm. and 4 gm. given at intervals of a week. A 10 per cent. solution was made in 0·75 per cent. salt solution.

The authors state that amongst the questions still requiring an answer are :—

(1) For what period does a prophylactic injection confer immunity ? (2) What is the most suitable dose for prophylactic purposes—2 gm., 3 gm. or 4 gm. ? (3) Are the three doses necessary in order to obtain a cure ? (4) Has the serum of a cured animal a therapeutic or prophylactic action for other animals of the same species ?

W. Y.

BAERMANN (G.). **Die Behandlung der Surra mit "Bayer 205."** [The Treatment of Surra with "Bayer 205."]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1922. Vol. 26. Beiheft No. 2. pp. 73–123.

Surra is endemic in the Malay Archipelago, and in many districts is so severe that the large domestic animals—horses, cattle, buffaloes and dogs—cannot be kept, or only with very great losses. Every now and again great epidemics occur. The disease may be acute, subacute or chronic—acute especially in horses and dogs and chronic in cattle and buffaloes.

In the earlier experiments, the author tested the action of the drug on infected guinea-pigs and rabbits with very successful results. Details are given of nine infected horses which were given intravenously either a single dose of the drug varying from 5 gm. to 10 gm., or three to five doses at short intervals, the total of which equalled 8 gm. to 25 gm. All the animals were apparently quickly cured and did not

relapse within the observation period, which varied from about 2–11 months. There follows a record of five horses which were unsuccessfully treated. In three horses an injection of the drug varying from 2 gm. to 6 gm. was given and the animals after varying intervals were inoculated with virulent blood ; in this way protection was shown to be conferred for at least 30–42 days. Other experiments are also described relating to the treatment of naturally infected horses, buffaloes and cattle.

As a result of his work, the author is of opinion that the action of " Bayer 205 " on surra is very promising. A final decision cannot yet be given. All the animals were not cured, but success in 50 to 75 per cent. of cases is a considerable achievement.

W. Y.

LEFROU (G.) & OUZILLEAU (F.). **Essai du tryparsamide dans le traitement de la maladie du sommeil.**—*Bull. Soc. Path. Exot.* 1922. Nov. 8. Vol. 15. No. 9. pp. 802–805.

Reference is made to the work of Dr. Louise PEARCE, of the Rockefeller Institute, on the treatment of sleeping sickness by tryparsamide [this *Bulletin*, Vol. 19, p. 136]. On her return to America, Dr. PEARCE sent some of the drug to Brazzaville, and the authors have examined its therapeutic value on a number of cases of the disease. PEARCE found that in the first stage of the disease single doses of from 0·3 gm. to 7 gm. caused disappearance of the trypanosomes from the peripheral blood within 24 hours and that parasites did not reappear for 3–6 weeks. With repeated doses (4–7) of 2 gm. to 7 gm. given at intervals of a week the action was very satisfactory, but the observation period is as yet too short to draw definite conclusions. In the second stage of the disease, a series of injections caused amelioration, but, unfortunately, Dr. PEARCE noted visual troubles in advanced cases.

The authors had in view the possibility of using the drug as a prophylactic cure in the bush and examined the duration of the sterilization produced by a single intravenous and subcutaneous injection. Details are given of five cases so treated. The conclusions are that intravenous administration results in a shorter sterilization than subcutaneous administration. By the latter method 2 gm. caused in one case sterilization lasting a year and 1 gm. in another case a sterilization lasting 84 days. Unfortunately, 2 gm. appear to be the maximum dose which can be given subcutaneously, as larger doses produce painful inflammatory reactions.

W. Y.

CLAPIER (P.). **Premiers essais au Gabon de l'acide oxyaminophényl-arsinique (Sel de Soude ou 189), dans la trypanosomiase humaine.** —*Bull. Soc. Path. Exot.* 1922. Oct. 11. Vol. 15. No. 8. pp. 729–755.

The therapeutic value of oxyaminophenylarsenic acid, " 189 ", was examined in a series of cases of sleeping sickness which had not previously been subjected to any other treatment. In 17 cases the drug was given subcutaneously or intramuscularly, in three orally, and in one intravenously.

It was found that doses of 0·02 gm. to 0·04 gm. per kilo of " 189 " given subcutaneously or intramuscularly caused the disappearance of the trypanosomes from the peripheral blood and gland-juice within

10–20 hours of the first injection. Intermittent treatment for 3–4 weeks produced a sterilization lasting four weeks or more after the last injection. Even, however, after repetition of large doses relapses were frequent in patients in whom the meninges were involved. They were also noted in cases in the first stage of the disease, but were of much rarer occurrence, and in these "189" gave good clinical results with rapid retrogression of the principal symptoms.

Comparing the action of the drug with that of atoxyl, it was found :—

1. That "189" produced more rapid sterilization of the blood and gland-juice.

2. That fewer injections of "189" gave long sterilization.

3. Repetition of large doses of "189" is less dangerous than massive doses of atoxyl, but toxic troubles may occur and its use over prolonged periods must be attended with care.

4. Atoxyl, even though it is inconstant in its effects, appeared to act more profoundly than "189", especially if it be associated with tartar emetic.

Only a single observation was made on a late case of the disease ; in this case it was also observed that the trypanosomes disappeared rapidly (within 7 hours) from the blood and gland-juice. The drug proved inactive when given in massive doses per os.

W. Y.

BLANCHARD (M.) & LEFROU (G.). **Le traitement de la maladie du sommeil par le "189."**—*Bull. Soc. Path. Exot.* 1922. Nov. 8. Vol. 15. No. 9. pp. 797–802.

The authors have tested the value of the sodium salt of oxyaminophenylarsenic acid, "189," on cases of sleeping sickness ; the salt contains 25 per cent. of arsenic. Three cases in the first stage of the disease were given respectively a single dose of 1 gm. intravenously, 1 gm. subcutaneously and 2 gm. subcutaneously. Peripheral sterilization was obtained in 24 hours ; the first case relapsed in 37 days, the second in 19 days, and the third remained free for 7 months. Six patients in the first stage of the disease were treated by six subcutaneous injections at weekly intervals, the total dose given being 8·5–10 gm. per case ; no relapse was observed in 3–7 months. The drug had no action when given by the mouth and none when given to cases in the second stage of the disease.

W. Y.

NAVARRO MARTIN (A.) & STÉFANOPOULO (G. J.). **Action de l'aminophénolarsinate de soude (189) sur les trypanosomiases expérimentales du cobaye.**—*Ann. Inst. Pasteur.* 1922. Aug. Vol. 36. No. 8. pp. 619–623.

In continuation of the work of NAVARRO [this *Bulletin*, Vol. 19, p. 512], the authors examined the action of "189" on guinea-pigs experimentally infected with *T. brucei* and *T. gambiense.*

The conclusions are :—

Aminophenylarsenate of sodium ("189") exerts an energetic curative effect on guinea-pigs infected with *T. brucei* and *T. gambiense.*

The chemotherapeutic coefficient is much more favourable than those which have been observed with any other known derivative of arsenic.

Subcutaneous injections of aqueous solutions (10 per cent.) of the drug are perfectly tolerated and do not provoke any local reaction.

W. Y.

FOURNEAU (E.) & NAVARRO-MARTIN (A.). **Traitement des trypanosomiases expérimentales par les acides oxyaminophénylarsiniques.** —*C.R. Soc. Biol.* 1922. Dec. 9. Vol. 87. No. 37. pp. 1197-1199.

The authors have conducted an enquiry into the therapeutic action of a number of arylarsenic acids. They have had in view more especially: (1) the discovery of derivatives which do not produce nervous troubles; (2) the discovery of substances of greater therapeutic activity than "189" (aminooxyphenylarsenic acid); and (3) the determining of the part played by chemical modifications in the chemotherapeutic coefficient.

They first worked with isomeres of "189" and of its acetyl derivative "190"; there exist nine isomeres of "189", or in all ten oxyaminophenylarsenic acids. In later experiments they modified these compounds in various ways.

It was found that of the six oxyaminophenylarsenic acids examined the most active was "189".

W. Y.

VAN DEN BRANDEN & VAN HOOF. **Le "Trépol" ou tartro-bismuthate de potassium et de sodium dans la Trypanosomiase humaine.**—*Bull. Soc. Path. Exot.* 1922. Oct. 11. Vol. 15. No. 8. pp. 692–693.

Trépol, or the tartro-bismuthate of sodium and potassium, was tried on three cases of sleeping sickness, in two of which the cerebrospinal fluid was altered, whilst in the other it was normal.

Two of the patients were given, from April 27 to May 16, 1922, 1·5 gm. of the drug in five doses of 0·3 gm., each suspended in 3 cc. of oil. One of the two cases bore the treatment well, but the other developed a diffuse bismuthic stomatitis. The third case received three similar doses between April 27 and May 5, 1922, when, owing to the development of an intense stomatitis, gingivitis and ulceration of the mouth, the treatment had to be stopped. The injections were given deep into the gluteal muscles; some were followed by a painful non-suppurative reaction; there was no albuminuria.

In two of the cases the trypanosomes disappeared from the circulation for a few days only, whilst in the third the disease progressed rapidly to a fatal issue.

W. Y.

LEFROU & OUZILLEAU. **Étude du liquide céphalo-rachidien considéré dans ses rapports avec l'évolution et le traitement de la maladie du sommeil.**—*Ann. Inst. Pasteur.* 1922. Dec. Vol. 36. No. 12. pp. 834–850.

The second stage of sleeping sickness commences with the invasion of the cerebrospinal fluid with trypanosomes. Flagellates are rarely seen on direct examination of the fluid, and even examination of the deposit resulting from centifugation is often negative. The infestation of the central nervous system and sub-arachnoid space results, however, in cytological and chemical changes in the cerebrospinal fluid.

Normal cerebrospinal fluid contains only a few lymphocytes (1–3 per cmm.), but in trypanosomiasis its cytology undergoes quantitative and qualitative changes. The former comprise an increase in the number of cellular elements which may reach 1,000 to 2,000 per cmm.

As regards chemical examination of the cerebrospinal fluid, albumen is the sole constituent for which the present study has any real value. Increase of albumen is of equal importance to leucocytosis, and in general the two occur together, but the quantity of albumen varies

much less than that of the cells. The quantity of albumen was determined by the method of DENIGÈS with Tanret reaction, the quantities thus obtained agreed with those given by the spinal albuminometer of Sicard and Cantaloube, which was employed as a control in many cases. The normal figure, 0·10–0·15 per thousand, is usually obtained in early stages with a slight leucocytosis ; rarely the figure may exceed 1 gm. Therapeutic agents modify the lymphocytosis much more easily than the quantity of albumen, and it seems that variations in the albumen content give more valuable information on the evolution of the meningitis than cytological alterations.

The proteid in the cerebrospinal fluid consists of a mixture of sérine and globulin. In some affections of the central nervous system, globulin is increased much more than sérine.

The authors examined the cerebrospinal fluid of a number of cases with Weichbrodt's reaction, which has been used as a test for globulin. The test consists in adding 0·3 cc. of a 0·1 per cent. solution of sublimate to 0·7 cc. of cerebrospinal fluid ; if a turbidity results immediately, the reaction is strongly positive ; if at the end of two or three minutes, it is feebly positive ; if the fluid remains clear, it is negative. The test was performed in 80 cases ; in 15 in which the cerebrospinal fluid was normal, *i.e.*, the albumen was 0·15 and the cells 20 or less, the reaction was negative ; of 65 in which the fluid was pathological, 52 had an albumen content of over 0·20 and cells of from 50 to 2,000 per cmm., and the reaction was always positive ; whilst in the remaining 13 the albumen content was 0·20 or less and the cells were between 44 and 580 per cmm. The reaction was positive in 8 cases and negative in 5 cases, only 1 of which had a protein content of 0·20. In 7 cases where there was no alteration in the protein content, but only lymphocytosis, the Weichbrodt reaction was feebly positive in three instances.

The authors next pass to a consideration of the relationship between the presence of trypanosomes in the cerebrospinal fluid and the meningeal reaction. They define a meningeal reaction as existing when the cellular content surpasses 20 and the albumen content 0·15. In order to determine whether a meningeal reaction as thus defined signifies an invasion of the cerebrospinal fluid by trypanosomes, they have examined the cerebrospinal fluid of 240 cases of sleeping sickness. In 100 of these trypanosomes were found in the fluid and in 140 they were not found. Details of these examinations are set forth in the following tables :—

1. Table showing the result of examination of the cerebrospinal fluid for trypanosomes in cases where the cellular elements were increased.

Number of Meningeal Cases.	Proportion of Meningeal Reactions.	Percentage of Cases with Trypanosomes.
13 with 28 to 50 cells	0 with trypanosomes. 13 without trypanosomes.	0
62 with 50 to 150 cells	7 with trypanosomes. 55 without trypanosomes.	11·2
74 with 160 to 400 cells	27 with trypanosomes. 47 without trypanosomes.	36·5
91 with 410 to 2,000 cells.	66 with trypanosomes. 25 without trypanosomes.	72·5

2. Table showing the result of examination of the cerebrospinal fluid for trypanosomes in cases where the protein content was normal or increased.

Number of Meningeal Cases.	Proportion of Meningeal Reactions.	Percentage of Cases with Trypanosomes.
17 with 0·1 of albumen.	0 with trypanosomes. 17 without trypanosomes.	0
34 with 0·2 of albumen.	7 with trypanosomes. 27 without trypanosomes.	20
108 of 0·3 to 0·5 of albumen.	33 with trypanosomes. 75 without trypanosomes.	30
81 of 0·6 to 1 gm. of albumen.	60 with trypanosomes. 21 without trypanosomes.	74

With regard to this part of their work, the authors conclude that in native cases of sleeping sickness :—

1. Cerebrospinal fluid which contains 0–20 cells and 0·10–0·15 of protein can be regarded as normal.

2. With 20–50 cells and below 0·20 protein, it is doubtful whether the second stage has commenced, in any case trypanosomes cannot be found by centrifuging the cerebrospinal fluid.

3. In cases with more than 50 cells and 0·20 protein, one can be sure that the disease is in its second stage even in the absence of trypanosomes on centrifuging the cerebrospinal fluid.

In the next section, the authors consider the relationship between the presence of trypanosomes in the blood or gland-juice and the meningeal reaction. They state that examination of the blood or glands gives information about the infectivity or not of the patient, but tells nothing about the state of the central nervous system. The absence of any relationship between the state of the blood and that of the cerebrospinal fluid is shown in a table.

From their observations it is concluded that examination of the blood or lymph throws no light on the evolution of the disease, and for this purpose examination of the cerebrospinal fluid is absolutely necessary.

The paper concludes with a series of remarks on the relationship existing between the meningeal reaction and clinical symptoms.

W. Y.

MARSHALL (Claude H.) & VASSALLO (S. M.). **The Treatment of Trypanosomiasis.** (A Further Report.)—*Brit. Med. Jl.* 1923. Feb. 10. pp. 231–235.

The authors in writing this paper had apparently two objects in view : (1) to record extended observations on cases treated by their method of "intrathecal injections of salvarsanized serum"; and (2) to reply to certain criticisms levelled by the reviewer at their previous papers [this *Bulletin*, Vol. 18, p. 153].

After referring to the earlier work on the subject by BALFOUR, VAN SOMEREN, THIROUX, D'ANFREVILLE and REICHENOW, the authors write as follows :—

"From the above extracts it is quite clear that those whose duties included the treatment of sleeping sickness in endemic areas were even then—as they are now—dissatisfied with the adequacy of the methods at their command ; so that it is almost incomprehensible to the present writers that the fact that they were following (even if unwittingly) the suggestion of such a keen observer and logical thinker as Balfour should have aroused so much and so uncompromising a hostility.

"Moreover, the method we now advocate is administratively and economically sound. The patient's treatment is completed in two or three days, when he is free to return to his village and friends. Large hospitals and camps are no longer required, nor is the patient's life made irksome by continuous drugging for long periods of time. The natives themselves appreciate these advantages and now come in of their own volition asking for treatment."

Having completed a further survey of the cases treated by various methods, the authors wish to present the results to the impartial reader, so as to make it clear where they are in agreement with the reviewer's arguments and where they consider their observations justify a totally different interpretation.

Dealing first with the virulence of the particular strain, and strains of trypanosomes met with in the Uganda Protectorate, the authors record in a table details of some 300 untreated cases observed for periods varying from 7–20 months.

TABLE I.—Showing the number of untreated cases alive after observation periods varying from 7 to 20 months.

District.	No. of Untreated Cases.	Months since first seen.	No. Alive.	No. Missing.	No. Dead.	Percentage of cases dead assuming that all who had disappeared were alive.	Percentage of cases dead assuming that all who had disappeared were dead.
Gulu ..	26	20	10	0	16	61	61
Arua ..	40	18	12	8	20	50	70
Toro & Katwe	28	18	11	8	9	31	60
East Madi ..	123	6	90	15	18	14·7	18·6
West Madi..	118	7	73	20	25	21	38

In another table are recorded the results of treating 11 Gulu cases, 9 with intrathecal salvarsanized serum and 2 with intramuscular salvarsanized serum. After the treatment the patients were sent home [some 300 miles] ; 2 advanced cases died on the way. The remaining cases were re-examined 15 months later, when it was found that another case had died and the others were alive and to all appearances well, but refused to allow any form of examination and are therefore omitted from the authors' calculations.

Six cases were treated with a single intravenous injection of neokharsivan or novarsenobillon only, varying in dose from 0·3 gm. to 0·6 gm. Of these, 2 were alive and well after 26 and 21 months respectively, 2 died after 8 and 4 months respectively, and 2 were found to have relapsed (trypanosomes found in blood or cerebrospinal fluid) after 3½ and 5½ months and were re-treated.

The authors summarize the results obtained up to date by treating sleeping sickness patients with a single intrathecal injection of salvarsanized serum as follows:—Of 12 unselected cases (2 advanced) observed for 2–3¼ years, 2 have disappeared, 2 are dead, 8 are alive and well, giving a percentage alive and well somewhere between 66·6 and 83·0 according to whether the missing are dead or alive; of the 17 unselected cases observed for 18–21 months, 1 has disappeared, 0 are dead, 16 are alive and well, giving a percentage alive and well between 94 and 100. These data are set out in the manner adopted by the reviewer and are tacked on to a portion of the reviewer's Table IV (*loc. cit*).

Marshall and Vassallo consider that "this table in its present form not only affords considerable support to our first assumption, but also goes far to confirm our statement that our routine method of treatment has furnished better results than any one hitherto published treatment of a series of cases." They further point out that their cases "have only received one complete treatment—that is, one intravenous injection of arsenic and one intrathecal injection of serum the following day, as against the prolonged treatments of others—a point completely ignored by Yorke." [Why Marshall and Vassallo have chosen to tack their data on to emasculated Table IV instead of on to Table III, which relates to short treatments, is not clear; it scarcely seems necessary to point out that the reviewer was fully aware of the nature of Marshall and Vassallo's treatment when he wrote the critique in question.]

In Table V details are given of the cases treated by the method the authors suggest should become a routine one, with the reports at the various periods presented on former occasions.

Apart from two cases, this table needs no comment. Cases 18 and 20 were found at a subsequent examination several months after treatment to harbour trypanosomes in their glands, but in both cases the cerebrospinal fluid was negative.

"Case 18 was treated on April 18th, 1920; three subsequent examinations were all negative; a fourth one, on July 27th, 1921, showed trypanosomes in glands.

"Case 20 was treated on April 25th, 1920; subsequent examinations were all negative, but on April 20th, 1921, trypanosomes were recovered from a gland by puncture."

The authors state that obviously these two cases would be claimed by hostile critics as instances of the failure of their routine treatment; they, however, consider them for various reasons, which are given at length, as reinfections. Acting on this belief the two cases were retreated "with a single intravenous injection of arsenic," and up to date they have remained well. [Without in any way wishing to pose as a hostile critic, one cannot refrain from pointing out to the authors that under the circumstances it might appear to some "impartial readers" safer to admit at least the possibility that these two cases had not been cured by the intrathecal treatment. The two are, however, apparently included in the 100 per cent. of cures of

the 17 cases observed for 18–21 months. Again there is some discrepancy between Table V and the summarized figures referred to previously. In Table V records are given of only 15 cases observed between 18–21 months and not 17 as stated previously. Finally, 8 months and 12 months make 20, and not 21, months, and this error is repeated through about half Table V.

TABLE V.—Cases treated by Intrathecal Salvarsanized Serum and Results to Date.

Case No.	Report up to 31.1.20.		Report up to 31.1.21.		Report up to 31.1.22.	
	Months since Treatment.	Remarks.	Months since Treatment.	Remarks.	Months since Treatment.	Remarks.
2	16	Well	28	Well	40	Well
3	1	Disappeared				
4	12	Well	24	Well	36	Well
5	1	Died (cause unknown)				
7	2	Well	14	Well	26	Well
8	4	Well	16	Well	28	Well
9	1½	Died				
10	2½	Died				
11	1½	Well	13½	Well	25½	Well
12	1½	Well	13½	Well	25½	Well
13	1½	Well	13½	Well	25½	Well
15	1½	Well	13½	Well	25½	Well
16	—	—	8	Well	21	Well
17	—	—	8	Well	21	Well
18	—	—	8	Well	21	Well
19	—	—	8	Well	21	Well
20	—	—	8	Missing	21	Well
21	—	—	8	Missing	21	Well
22	—	—	8	Well	21	Well
23	—	—	8	Well	21	Well
24	—	—	8	Well	21	Well
25	—	—	8	Well	21	Well
26	—	—	7½	Well	20½	Missing
27	—	—	7½	Well	20½	Well
29	—	—	7½	Well	20½	Well
30	—	—	6½	Well	19½	Well
32	—	—	6½	Well	19½	Well
33	—	—	1 day	Died*		
46	—	—	—	—	16½	Well
55	—	—	—	—	13	Well
60	—	—	—	—	11	Well
61	—	—	—	—	11	Well

* Chloroform poisoning.

[While the authors have evidently studied with some care the reviewer's critique and their present paper has to some extent benefited thereby, they have unfortunately failed to grasp its main point. The reviewer has no prejudice against intrathecal or any other form of treatment, but he has a very strong dislike to sweeping claims based

on little or no evidence. Marshall and Vassallo's treatment may be all that they claim for it, but their earlier papers produced no evidence to support the claim, and their last effort is little better. Sleeping sickness varies enormously in virulence in different regions and even in the same region at different times, and the authors cannot be said to have commenced to establish their sweeping claims until they have at least shown by an adequate number of controls that an intravenous injection of salvarsan plus intrathecal injection of salvarsanized serum gives better results than an intravenous injection of salvarsan alone.]

W. Y.

Reich (W. W.) & Beckwith (T. D.). *Trypanosoma brucei* **as a Filterable Virus. A Preliminary Note.**—*Jl. Parasit.* 1922. Dec. Vol. 9. No. 2. pp. 93–98.

The discussion and results are as follows :—

"The possibility of the existence of forms still smaller than those described in the stained smears, and their relation or identity with the filter-passing entity, must be borne in mind as a distinct possibility. The divergence in the results reported by various investigators may be due to (1) differences in the technique ; (2) peculiarity of the particular strain ; and (3) to the presence or absence of the specific form changes alluded to. In the opinion of the writers, the last condition should prove to be an important postulate.

"1. Form changes are described in the blood and organs of white rats and guinea-pigs dying of infection with *Trypanosoma brucei*.

"2. The viability of these forms is evidenced cytologically by the mitotic figures and physiologically by their infectiveness.

"3. The blood and organs of guinea-pigs dying or dead of infection with *T. brucei*, and in which the form changes described occur, when filtered through a bacteria-proof filter, yield filtrates which in ten cases out of nineteen were infective for guinea-pigs.

"4. The possible relation between this filterable virus and certain of the described 'involution forms' or with a problematical ultra-microscopic stage in the life of this parasite is pointed out."

W. Y.

Peutz (J. L. A.). **Het serum met de eigenschap trypanosomen te dooden en zijn beteekenis voor de kliniek.** [Trypanocidal Serum and its Clinical Significance.]—*Nederl. Tijdschr. v. Geneesk.* 1922. Vol. 66. Pt. 2. No. 14. pp. 1544–1550.

Peutz experimented with *Trypanosoma brucei* and tested the influence of different sera from healthy persons and patients suffering from various diseases on its pathogenicity for mice. The trypanocidal property of the normal serum may diminish or disappear in pathological conditions, but no fixed rules could be detected which might render this phenomenon of diagnostical importance.

W. J. Bais.

Chagas (Carlōs) & Villela (Eurico). [In Portuguese and English.] **Forma cardiaca da Trypanosomiase Americana. Cardiac Form of American Trypanosomiasis.**—*Mem. Inst. Oswaldo Cruz.* 1922. Vol. 14. No. 1. pp. 5–61 [Portuguese] ; 3–54 [English].

In the clinical picture of American trypanosomiasis there are certain very constant and prominent symptoms which characterize the cardiac form of the disease. As the result of observing a large number of cases, the authors state that they can be divided into two groups : one in which the cardiac changes are of muscular origin and the other in

which the changes are associated with deficient nervous influences; the latter are, however, usually associated with the former. Arrhythmia constitutes the predominant note in such cardiopathies, and in its various types are interpreted anomalies of the principal functions of the muscle. The authors have studied the following groups and alterations of rhythm :—

1. Total tachycardias and bradycardias (of sinus origin).
2. Alterations of conductibility, manifested by—
   (*a*) delay in the conduction of the contractile stimulus (increase of the space ac of P.V.);
   (*b*) partial block;
   (*c*) total block (dissociation of auriculoventricular rhythm with persistence of ventricular rhythm).
3. Premature contractions—
   (*a*) auricular extrasystoles;
   (*b*) ventricular extrasystoles;
   (*c*) nodal extrasystoles.
4. Auricular tachysystole (auricular flutter).
5. Paroxystic tachycardia (auricular, ventricular and nodal).
6. Complete arrhythmia (auricular fibrillation).
7. Cardiac alterations.

Each of these conditions is dealt with in considerable detail. Under the heading "General symptomatology of the cardiac form," the authors consider the principal features, or rather those which are repeated with the greatest frequency. The symptoms of insufficiency occupy the first place and are indicated by low arterial tension, visceral congestion, dyspnoea, fatigue on exertion, oedemas, etc. The oedemas are relatively slight as compared with those seen in Bright's disease, doubtless on account of the absence of renal changes. The great generalized infiltration is only observed in relatively rare cases of cardiac asystole. The physical sign of great frequency is increase in the volume of the heart. Other signs are murmurs due to valvular insufficiency, obscuring of the heart sounds, alterations in intensity, and amplitude of the apex beat.

The various subjective symptoms, especially those directly related to the different forms of arrhythmia, are dealt with in considerable detail. Some patients complain of precordial anxiety and a sense of constriction originating in the epigastrium or the precordium and ascending to the throat, where it is most intense and causes dyspnoea and oppression, frequently followed by faintness and transitory dizziness. Other patients refer to general malaise with unpleasant perception of the heart beats, rapid or slow, and painful sensations in the epigastrium and larynx, accompanied by respiratory difficulty. Finally, a large number of patients complain only of the "agony," without being able to define or localize the sensations that constitute it. The authors add that "agony" means nothing to the student of symptomatology, but everything to the patient.

Palpitations form another symptom of great frequence in the cardiac form of the disease; they occur almost always in crises of short duration and subject the patient to the most painful sensations.

Faintness is a very common symptom, and is sometimes limited to simple transitory obscurity of vision, but at other times is more intense and accompanied by vertigo and loss of consciousness.

Referring to the prognosis, the authors state that the cardiac form is the type of the disease which occasions the greatest mortality. The condition is progressive; there is no possibility of retrogression, and

the disease proceeds more or less rapidly to a fatal termination. Clinical details are given of 63 cases which came under the notice of the authors.

[It is impossible in a short summary to deal adequately with this lengthy paper. Those interested should consult it in the original.]

W. Y.

ROSENTHAL (F.) & FREUND (R.). **III. Ueber den Mechanismus des Trypanocidieschwundes bei Leberkranken.** [The Mechanism of the Disappearance of the Trypanocidal Bodies from the Serum in Liver Diseases.]—*Ztschr. f. Hyg. u. Infektionskr.* 1922. Vol. 97. No. 1–2. pp. 137–150.

In previous communications [this *Bulletin*, Vol. 19, p. 154 and p. 520] the author showed that in different liver conditions the trypanocidal titre of the serum remained within normal limits, save only in icteric conditions and in the severest diffuse parenchymatous diseases, whether accompanied by jaundice or not; in these the titre exhibited a definite and often considerable fall, sometimes reaching zero.

Experiments are recorded showing that the icteric serum obtained from a case of cancer of the liver blocking the bile duct, which had no protective action, did not inhibit the protective action of normal serum when mixed with it and injected into normal mice. In further experiments profound icterus was produced in mice by means of injection of 1 cc. of a 1 in 5,000 solution of dimethylpyrrolphenylarsenic acid; it was found that normal human serum exerted its prophylactic action in these jaundiced animals just as well as in normal mice. From experiments of this nature, the authors conclude that the failure of trypanocidal action of human serum in icteric conditions is not due to the limiting effect of the bile constituents, but to an actual absence of trypanocidal substance, owing to its non-formation. Consequently, as stated in their previous papers, the authors consider that they are dealing with a new physiological function of the liver.

The remainder of the paper is concerned with disproving certain explanations of the phenomenon which LANGE had suggested. These are briefly as follows:—

1. In liver diseases the complement content of the blood decreases proportionately to the content of bile acids.
2. The trypanocidal substance in human serum is a complex body which requires complement to activate it; the human serum loses its trypanocidal power owing to the complement destruction due to bile acids.
3. The mouse organism is not able to activate human amboceptor, and the icteric serum with its depleted complement can likewise not suffice, and consequently has no therapeutic value.

Rosenthal and Freund state that this thesis is wholly hypothetical and that the hypotheses are incorrect—a fact which they proceed to demonstrate by means of a series of experiments.

W. Y.

LEICHTENTRITT (Br.) & ZIELASKOWSKI (Mary). **Der Gehalt des kindlichen Serums an trypanoziden Substanz. Ein Beitrag zur serologischen Diagnose der Möller-Barlowschen Krankheit und der ihr verwandten Zustände.** [The Content of Trypanocidal Substance in Children's Serum. The Serological Diagnosis of the Möller-Barlow Disease and Related Conditions.]—*Jahrbuch d. Kinderheilk.* 1922. June. Vol. 98. 3rd Ser. Vol. 48. No. 5/6. pp. 310–239.

In this work the authors have enquired whether the serum of children suffering from Barlow's disease differed from that of healthy children in its trypanocidal action. It was found that in the acute stage of a case

of Barlow's disease, the trypanocidal bodies in the serum were decreased, and that as convalescence set in the trypanocidal titre rose again. It is shown in a series of tables that the greatest decrease in trypanocidal activity of the serum did not occur during the acute stage of the disease or during a relapse, but during convalescence. The explanation of this is to be found in a definite biological interference in the organism. Four months after the disease, when the child was in good condition, the trypanocidal power of its serum had risen considerably. A similar reduction of the trypanocidal titre was seen in the case of a 13-months' child which for 2½ months had been fed solely on milk and was not thriving, and also in the case of a child exhibiting haemorrhages, the result of malnutrition. Such cases are probably in the pre-Barlow stage.

A number of cases of "defective" diseases in children were investigated. Two children suffering from the hydraemic form of disease, from farinaceous feeding, with ulceration of the cornea exhibited a great decrease of trypanocidal titre, but four others in the atrophic stage of the disease exhibited no such decrease.

W. Y.

BALFOUR (Andrew). **The Cure of Sleeping Sickness.**—Reprinted from *Empire Review.* 1923. Feb. 16 pp.

REGNAULT (F.). **A propos du paludisme en Corse.**—*Bull. Soc. Path. Exot.* 1922. Dec. 13. Vol. 15. No. 10. pp. 935–936.

HELMINTHIASIS.

HOOKWORM CAMPAIGNS (1919).*

Panama (1919).†

During 1919 work was completed in San Lorenzo district of the province of Chiriqui and in Santiago district of the province of Veraguas. The population of the first district numbers 8,871. Horconcitos, the capital, is 300 miles from Panama City, and the only available transportation is by means of small coastal steamers. Surrounding Horconcitos are many small camps ranging in size from ten to sixty huts. These are made of bamboo and are plastered with a fair "mortar" called "quincha" composed of cow faeces and clay. The huts have only one room in which the whole family and the ever-present pig sleep. None of the houses is provided with privies and soil pollution prevails. The sandy soil is very favourable to the propagation of hookworm. The local index of infection is 90 per cent. The majority of the people belong to the brown race. Their chief occupations are agriculture and cattle raising. They are very poor and lazy and their habits make progress difficult in the hookworm campaign.

In the district of Santiago, in the province of Veraguas, work which was commenced in January was continued throughout the year until December 15. Veraguas has a population of 60,000, and mining is the main industry. The town of Santiago is 375 ft. above sea level. The climate is damp and the rainfall heavy and accompanied by frequent thunderstorms. The principal occupations are agriculture, cattle raising and commerce. The hookworm index of the district is 97 per cent.

Campaigns were also conducted in the districts of David and Gualaca and at the central offices in Panama.

In these areas, in which operations were completed during 1919, the number of persons examined for hookworm was 15,307. Of these 88·1 per cent. were found infected. First treatment was administered to 87·6 per cent. of those infected and 50·2 per cent. of those treated were cured. During the year much effort was expended in the endeavour to follow up treatment to a cure, with the result that the percentage of cured shows an increase of 14·4 per cent. over that of the previous year. Other intestinal parasites found incidentally during 1919 were Ascaris 40·2 per cent., Trichocephalus 15·5 per cent., Strongyloides 1 per cent., Taenia 0·5 per cent., Oxyuris 0·2 per cent.

Nicaragua (1919).‡

In Nicaragua the great mass of the population is a composite mixture of descendants from the native Indians, their Spanish conquerors, and the negro slaves introduced during the colonial period.

Operations were completed during 1919 in the areas of Comalapa and Camoapa in the department of Chomtales, and in Mina Leonesa and San Ramon—small centres in the department of Matagalpa. Work was also conducted in the Managua and Leon dispensary districts. A reinfection survey was made of the town of Nandasmo. In practically all the districts the work resolved itself into an effort to reduce mass infection. Little could be done to improve existing sanitary conditions, as the people were indolent in nature and nomadic in habit.

The number of persons examined for hookworm in areas completed during 1919 numbered 12,246. Of these 47·5 per cent. were found infected. First treatment was administered to 83 per cent. of those

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* For 1918, see this *Bulletin*, Vol. 18, pp. 124–135.

† Report (No. 7,514) on Work for the Relief and Control of Hookworm Disease in Panama, by Dr. Frederick A. Miller.

‡ Report (No. 7,516) on Work for the Relief and Control of Hookworm Disease in Nicaragua, by Dr. D. M. Molloy.

infected and 29·9 per cent. of those treated were cured. It was found that the addition of 25 per cent. chloroform greatly increased the anthelminthic effect of chenopodium without causing any unpleasant effects. In the rural districts of Matagalpa a mixture of chenopodium and croton oil (10 oz. chenopodium and 7·4 mils of croton oil) was used exclusively. This addition possesses certain advantages, particularly in rural communities, for the individuals treated can be kept in the dispensary until the croton oil produces mild purgation. Neither preliminary purge nor abstinence from food (except on the morning of treatment) is required.

Other parasites incidentally found were Ascaris 21·4 per cent., Trichocephalus 15·9 per cent., Oxyuris 0·3 per cent. A few cases occurred with Strongyloides and Taenia.

"In March 1919, a resurvey of the town of Nandasmo was made for the purpose of determining how permanent was the work that had been done there eighteen months earlier. The re-examination of 328 persons declared cured during the campaign of 1917, revealed that 190, or 57·9 per cent., of them had become re-infected. This infected group is divided into two parts: those who received treatment and were provided with privies during the dry season of the original campaign and those who did not receive treatment or inaugurate sanitary measures until after the beginning of the rainy season. The re-examination showed that the rate of re-infection during the dry season was 43 per cent. and the rate of re-infection during the rainy season was 67 per cent. Old soil-infection is supposed to have caused a large part of the re-infections in this area. Infected children are also supposed to have contributed largely to the re-infections, as children habitually pollute the soil in the immediate vicinity of the house.

"If sanitary work is to be effectual, it seems that the preliminary work must be done at least six months in advance of the laboratory work, in order that one dry season may elapse before establishing curative measures. During this dry season a large proportion of the larvae will be desiccated and the old soil infection will be reduced to a minimum. If sanitary regulations are then enforced and no new soil pollution occurs, the danger of re-infection will be greatly lessened."

British Guiana (1919).*

Owing to the illness of Dr. Dershimer, Field Director, the operations were brought to a temporary close on February 15, 1919. During the first six weeks of the year work was completed in Areas A and B of the West Coast district of Demerara, where it had been begun in 1918. The field of operation had been extended to include the villages of Uitvlugt and Stewartville, but was not completed when the operation was suspended.

The census for areas completed during 1919 was 4,079. 3,991 persons, *i.e.*, 97·8 per cent., were examined for hookworm. 72·5 per cent. of these were found infected. First treatment was given to 91·8 per cent. of these and 66·1 per cent. were shown to have been cured.

Records were kept of the eggs of other intestinal parasites incidentally found and 25·3 per cent. of the persons examined showed Ascaris, 12·6 per cent. Trichocephalus, and 3·6 per cent. Strongyloides. It is stated that as in other campaigns, these figures are not to be taken as a reliable index of infection.

St. Lucia (1919).†

The population of St. Lucia is approximately 50,000, and during the five years from 1915–19, practically half the territory of the island has been covered by hookworm campaigns. During 1919 operations were completed in the Canaries Valley and in a portion of the Soufriere Valley

* Report (No. 7,524) on Work for the Relief and Control of Hookworm Disease in British Guiana by Dr. F. W. Dershimer.

† Report (No. 7,519) on Work of the Relief and Control of Hookworm Disease in St. Lucia, by Dr. Stanley Branch.

up to and including Soufriere Village, the second largest town in the colony, these embracing 35 square miles of territory on the leeward coast. As at Castries there are public latrines on the beach over-reaching the sea and each householder is supposed to arrange for the disposal of his night soil in the sea during certain hours of the night. This arrangement is fairly faithfully carried out except at Colombette and Coin de l'Anse, where a small ravine bed and a patch of cocoa serve as the dumping ground.

The total census for the areas completed during 1919 was 4,366 persons of whom 99·6 per cent. were examined for hookworm. Of these 59·7 per cent. were found infected. First treatment was administered to 98·1 per cent. of those infected and 92·8 per cent. of those treated were found to be cured. The most intensely infected area was found to be that lying between Anse la Raye and Canaries and in these areas 82·3 per cent. of the population were infected. The Soufriere Village had the lowest infection rate, viz., 45·7 per cent.

The record kept of other parasites, incidentally detected in the search for hookworm ova, showed that 22·3 per cent. of the 4,350 persons examined had Ascaris, 22·3 per cent. had Trichocephalus, and 1·7 per cent. had Strongyloides.

Four small Clayton-Lane Septic Tanks were installed at Soufriere and one erected for washerwomen and their children became so popular that an average of from 35 to 40 persons used it daily. Dr. Branch is of opinion that similar installations would prove satisfactory at the St. Lucia Schools, which at present are deplorably lacking in latrine accommodation.

Trinidad (1919).*

During 1919, the work was in charge of Dr. G. C. Payne until August 31, and thereafter of Dr. F. W. Dershimer and Dr. R. B. Hill. Work was completed in the Cunupia and Chaguanas areas and at the Tacarigua Orphanage.

During the year, 9,167 persons were examined in the areas in which operations were completed. Of these 81·7 per cent. were found infected. First treatment was given to 93·2 per cent. of these and 74 per cent. of those treated were pronounced cured. This comparatively low percentage of cures was due to physical factors beyond the control of the staff and people. The rice harvest demanded continuous labour from everyone during that season and thus hampered the administration; the high cost of treating isolated cases in sparsely settled localities and the occurrence of an influenza epidemic necessitated the suspension of the campaign for six weeks, during which period many people left the district.

The chief vermifuge used was 45 gr. of thymol finely powdered, mixed with an equal quantity of sodium bicarbonate and administered in gelatine capsules in two equal doses, one at 6 a.m., and one at 8 a.m., preceded on the previous evening and following two hours after the dosage by Epsom salts. Oil of chenopodium was given to children and to adults with latent and active dysentery. In the case of very small children, castor oil was used as the purge.

The infection rate with other parasites, as observed incidentally in the course of the work, was for Ascaris, 29·8 per cent.; Trichocephalus, 27 per cent; and Strongyloides, 6·1 per cent. Out of a total of 49,649 persons, Taenia was observed in only 20, and Oxyuris in 173.

Seychelles (1919).†

Intensive operations were completed during 1919, in the area comprising the island of Praslin and the adjacent islands of Round Island, Curieuse, Aride, Cousin and Cousine and in the Digue area, comprising La Digue,

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* Report (No. 7,533) on Work for the Relief and Control of Hookworm Disease in Trinidad, by Dr. G. C. Payne.

† Report (No. 7,528) on Work for the Relief and Control of Hookworm Disease in Seychelles, by Dr. J. F. Kendrick.

Felicite, Sisters, and Marianne Islands. Upon the completion of these areas in 1919, all parts of the Seychelles had been dealt with, save numerous very small islands lying some hundreds of miles from the main group and having exceedingly sparse populations.

Most of the people of Praslin work on the cocoanut estates or ply small sailing vessels between the islands. The population of the five small islands grouped with Praslin is 169. The island La Digue is about four square miles and most of the population is settled on the seashore of the western side, on what is named the "Plateau"—a low, moist, sandy ground particularly well shaded by palms.

99·8 per cent. of 3,715 inhabitants were examined for hookworm in the areas completed during 1919. 86·6 per cent. of those examined were found to be infected. First treatment was administered to 97·4 per cent. of these, and 91 per cent. of those so treated were cured.

From the beginning of the work a record was kept of other ova than hookworm, incidentally detected in the stools. Of a grand total of 21,766 persons examined, 66·3 per cent were found infected with Ascaris, 95·3 per cent. with Trichocephalus and 3·3 per cent. with Strongyloides.

On the completion of the regular campaign in 1919, it was decided to conduct a re-campaign for complete eradication. The Seychelles presented conditions peculiarly favourable for an experimental demonstration in the complete eradication of hookworm disease from a specific area because of their remote location, their small populations and the splendid co-operation of both Government and people.

A census of areas completed in this re-campaign up to December, 1919, showed a total population of 7,108. Of these, 99·8 per cent. were examined again, and of these 52·3 per cent. were found infected. Treatment was given to 96·3 per cent. of these and 91·5 per cent. of those treated were cured.

The results of the re-campaign was to show that the infection rate of 96·1 per cent. ascertained in 1917, had dropped 43·8 per cent. in the two intervening years as a result of the hookworm campaign.

Ceylon (1919).*

Hookworm control operations were completed during 1919 in the areas Gampola, Kotagala, and Talawakelle in Central Provinces; and Badulla in Province of Uva.

In Ceylon the work has been confined almost entirely to districts made up of tea and rubber plantations. On the rubber plantations, which are situated at elevations below 2,500 ft., every condition favours the propagation of hookworm disease; the climate is warm, the soil sandy and the shade and moisture extensive. The clay soil of the tea plantations, which are situated at elevations over 2,500 ft., is somewhat less favourable to the development of hookworm larvae, but even here the infection rate is high. The estates are worked by imported "Tamil" labourers recruited from southern India and are under the direction of English Superintendents. The labourers are housed in barracks or "lines" consisting of either a single row of rooms or of a double row placed back to back. The floors and walls of the rooms are of mud and the roof of zinc. Each room usually harbours a family of about five persons and is approximately twelve feet square. All "lines" are by law provided with latrines, but great difficulty is experienced in preventing soil pollution.

The campaign was conducted upon the intensive plan except that only a percentage (10–20) of the coolies were examined for hookworm ova prior to treatment. The census for the areas completed during 1919 showed a population of 111,002. 13·9 per cent. of these were examined for hookworm and 77·5 per cent. were found infected. First treatment was administered to 88,602 persons, and 77·9 per cent. of these treated

* Report (No. 7,542) on Work for the Relief and Control of Hookworm Disease in Ceylon, by Dr. W. P. Norris, Dr. W. P. Jacocks, Dr. S. A. Winsor, Dr. S. T. Gunasekara, Dr. Fitzroy Keyt.

were pronounced cured. From the beginning of the campaign in Ceylon in 1916, to the end of the year 1919, 444,695 treatments have been administered.

Of other parasites seen by the microscopists since 1916, it is noted that 65·3 per cent. of 93,333 persons examined harboured Ascaris, 53·7 per cent. Trichocephalus, while only 19 persons were reported with Strongyloides, 6 with Oxyuris and 3 with Taenia. The figures probably do not give an accurate index of these infections.

"Chenopodium was used as the anthelmintic during 1919. The directors of the work in Ceylon have worked out a standard dosage table for children and adults. Children who *appear* to be between the ages of two and twelve years receive 1 minim (·06 mils) for each year of age, minus 1 minim. This means that a child of seven receives 6 minims (·37 mils), a child of six, 5 minims (·31 mils), and so on. Persons from thirteen to fourteen years of age receive 13 minims (·81 mils); those from fifteen to sixteen, 16 minims (·99 mils); those from seventeen to eighteen, 20 minims (1·24 mils); and those from nineteen to twenty, 24 minims (1·49 mils). It will be seen that especially small doses are administered to children under twelve. The oil is dropped from a dropping-bottle into simple sugar syrup, the most satisfactory of all vehicles for administering this oil.

"In the administration of chenopodium in Ceylon, the best results were secured when the patients were allowed their usual diet on the day before treatment. As the average laborer in this country is greatly under-nourished, it was found that coolies who ate an ordinary meal on the afternoon before treatment were much less apt to suffer collapse or syncope after medication than those who were limited to an afternoon meal of rice gruel. The percentage of cures was as high among patients whose afternoon meal was not restricted as among those who ate a light repast.

"During 1918, there was developed a special form of treatment which was used extensively during that year and in the early part of 1919. According to this treatment the preliminary purge was omitted, and a mixture of chenopodium 40 parts, and croton oil 1 part was given in the standard dosage prescribed for chenopodium, graduated according to the apparent and not the stated age of each person. The dose was usually given in two equal parts with an interval of one hour between. Two hours after the last dose of vermicide, the patient received a purgative dose of magnesium sulphate. All patients were kept under observation by the dispenser, from the time of giving the first portion of the vermicide until the medical officer in charge was satisfied that the post-treatment purgative had acted freely. Meanwhile, the patients were allowed to rest in a sheltered place. Temporary sheltered latrines for men and women were provided near the resting place, and an apothecary or dispenser saw that the latrines were properly used. Before the patients were discharged, they were strongly counselled not to eat raw fruit or vegetables for a day or two after treatment, but to take chiefly rice and rice gruel.

"At first, the advantages of this form of treatment were found to be many. Some of its best features were that smaller doses of salts were required to secure effective post-treatment purgation, that such after-effects as exhaustion, rheumatoid pains, and tinnitus were much less in evidence, and that in almost all cases the patients were able to work the following day. In the early part of 1919, however, a small percentage of cases treated with the chenopodium-croton oil mixture developed enteritis. In some patients dysenteric symptoms developed which required prolonged treatment. These untoward symptoms created a prejudice against the mixed treatment which was difficult to allay, and in May it was decided to discontinue its use temporarily, substituting for it the plain chenopodium treatment.

"Morbidity statistics gathered from numerous Ceylon estates illustrate the degree to which improvement in general health follows treatment for hookworm disease. During the 1918 influenza epidemic, on all the estates embraced within the Maskeliya area, where the total laboring population numbered 17,838, the death rate from influenza and its sequelae was twice

as high among persons who had not been treated for hookworm disease as among those who had received treatment. The deaths numbered 111, or 7·5 per thousand, among 14,659 persons who had received treatment for hookworm infection previous to being attacked with influenza, as compared with 43, or 13·8 per thousand, among persons who had not been treated for hookworm disease.

"In another area, the District Medical Officer reported that only 2,604 patients were admitted to hospital in 1918 after measures against hookworm disease had been carried out in his locality, as compared with 3,694 in 1916 before systematic operations for the control of the disease had been inaugurated. This represents a reduction of 27 per cent. in the number of hospital admissions.

. . . . .

"The estate laborer's disregard for sanitation has resulted in a high rate of re-infection among persons previously treated and presumably cured. On the thirty-three estates of the Matale area whose laboring force was partially re-examined during 1918, following the lapse of at least a year after they had been cured, the average percentage of re-infection was 88 among a total of approximately 3,000 persons examined. The rate ranged from as low as 45 per cent. on one estate to as high as 100 per cent. on ten. Nineteen of the estates had re-infection percentages between 91 and 100; six between 81 and 90; three between 71 and 80; and only five less than 70. On thirty-eight estates of this area where re-examinations were made during 1919, re-infection rates varied among persons cured twenty-two months earlier, from 40 to 91 per cent.

. . . . .

"The figures presented in the foregoing paragraphs should not be interpreted as indicating the failure of anti-hookworm measures in Ceylon. The percentage of re-infection is not an adequate criterion for determining the efficacy of a treatment campaign. The problem of hookworm control is in the main one of reducing mass infection. The practical phase of the task is concerned with the removal of the largest possible number of worms from the largest possible number of infected persons. Upon this basis the best criterion for judging the effectiveness of a curative campaign in any area is not the percentage of infected persons who are cured or who remain cured, but the proportion, expelled or destroyed, of the total worms harbored by the population. Even though in certain areas, from 50 to 100 per cent. of the persons formerly cured have become re-infected, there is little doubt that the average number of worms harbored by each infected person has been very materially reduced. Since hookworms do not multiply within the human host but gradually die of old age and are eliminated without the use of medicine, infection is maintained solely by the entrance of new worms into the body. With the growth of effective sanitation, the possibility of new infection will gradually diminish and in time patients harboring light infections should automatically become hookworm-free."

Siam (1919).*

An initial demonstration in the relief and control of hookworm disease which was begun in Siam in February, 1917, was continued until March, 1919, under the directorship of Dr. M. E. Barnes. The campaign was confined to the ancient city of Chiengmai and its environs. During the two and a half months in which operations were conducted in 1919 dispensary work was accomplished in the districts of Handong, Ban Maa, Doi Saket, Vieng Pa Pao, and Maa Sui, and treatment for hookworm disease was administered to 5,538 persons and considerable incidental work was also done.

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* Report (No. 7,538) on Work for the Relief and Control of Hookworm Disease in Siam, by Dr. M. E. Barnes.

Queensland (1919).†

From October, when the campaign under the joint auspices of the International Health Board and the Australian Government began, until December, 1919, two intensive units were maintained, one at Bowen, with Dr. S. M. LAMBERT in charge, and the other at Mackay, under Dr. G. P. PAUL. As work was not completed in these areas by the end of 1919 the report given is merely one of progress.

Fifty-five per cent. of the territory of Queensland lies within the Tropics. The Great Dividing Range parallel with the coast separates a wet and narrow coastal belt from a dry interior. The population is essentially British with a small intermingling of Italians, Slavs, Chinese, and of Aboriginals. The average density is one per square mile and the larger settlements and bulk of the people are on the coast. The chief industries are sugar production on the coast and farming in the interior, with metal and coal mining in the hills. Although North Queensland has been for four decades under development by white settlers, it lacks the sanitary conveniences so necessary to health in the Tropics.

In the Bowen and Mackay areas, in which operations were conducted during 1919, the number of persons examined were 7,731, of whom 8·5 per cent. were found infected. Special attention was directed to the aborigines, as these are supposed to be the chief carriers of the disease, as 80 per cent. of all examined to date in Australia have been found infected.

R. T. Leiper.

[The various Reports referred to in the footnotes are issued by the Rockefeller Foundation, International Health Board, as lithographed Reports for limited distribution.—ED.]

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† Report (No. 7,540) on Work for the Relief and Control of Hookworm Disease in Queensland, Australia, by Dr. W. A. SAWYER.

REVIEWS AND NOTICES.

COLES (Alfred C.). **Critical Microscopy. How to get the Best out of the Microscope.**—pp. viii + 104. With 8 illustrations. 1921. London: J. & A. Churchill, 7, Great Marlborough Street. [Price 7*s*. 6*d*. net.]

This small book deals with subjects of much importance and interest to all those who wish to obtain the best results from the microscope. Although there are already many excellent and justly valued works on microscopy, Dr. Coles presents the practical aspects of the subject in such an attractive and readable way that his book is a welcome addition to their number.

As the title implies, the greater part of the book is devoted to the methods of obtaining a critical image of a microscopic object. Whilst it is indisputable that the highest attainable optical efficiency cannot be secured without attention to such subjects as critical illumination, tube-length adjustment for the thickness of the cover-glass, the use of the bull's-eye condenser, and so on, the fact remains that, even in the very exacting field of protozoological research, most excellent work has been done by persons of different nationalities, most of whom used the microscopes, which are to be seen in most laboratories, of the usual Continental form; and yet critical images (as defined by Mr. E. M. NELSON) are unobtainable with such apparatus. One might argue that the results, brilliant as many of them are, would have been still better if the investigators had been willing to devote more time and attention to the details of their methods of observation; but, when one looks at the beautiful and accurate drawings of such men as EHRENBERG, STEIN, and BÜTSCHLI, one cannot believe that there was much amiss with their technique. Certainly, for most medical work, the refinements mentioned above are not indispensable. The ordinary practitioner is usually willing to sacrifice, even to a considerable extent, the brilliancy of the image to the saving of time gained by his somewhat rough-and-ready methods. Most of the slides that he examines are of stained material, and he is usually more concerned with a speedy diagnosis than with an investigation of minute details of structure. But even the medical practitioner, when he turns to high-power dark-ground illumination or photomicrography, will find that some improvement of method is necessary, and will be grateful for the practical advice which Dr. Coles gives him.

The author discusses the choice of lenses for ordinary pathological, bacteriological and protozoological work. Probably nine-tenths of the workers at these subjects in this country use the following objectives: $\frac{2}{3}$ in, $\frac{1}{6}$ in., and $\frac{1}{12}$ in. oil immersion. Dr. Coles recommends, in place of the $\frac{1}{6}$ in., a good $\frac{1}{3}$ in., or apochromatic 8 mm. He points out that such a lens has considerable penetration; that its N.A. is not too large for dark ground illumination obtained by means fo a condenser, used dry with a stop; that it has a long working distance; that it will stand the highest eyepiece, and, with suitable tube-length, gives a range of magnification from less than 60 up to nearly 600 diameters.

The subject of dark ground illumination is well dealt with. For ordinary diagnostic work Dr. Coles prefers the use of a $\frac{1}{3}$ in. (or 8 mm. Apo.), a dry achromatic (*not* an Abbe) substage condenser fitted with a central expanding stop, an ordinary paraffin microscope lamp, and a bull's-eye. The advantages of this equipment are that the same condenser is used as that required for ordinary work; within reasonable limits the thickness of the slide is not of much importance; the slide does not require to be oiled to the condenser, and there is, therefore, no risk of the oil getting on to the stage; one can pass from dark-ground to ordinary illumination in a moment. It is not claimed that as brilliant an image is obtained by this method as by the more customary use of a specially constructed condenser in oil-contact with the slide, but the convenience and simplicity of the plan are certainly very much in its favour.

Dr. Coles writes very modestly of his experience of photomicrography, though his skill in this matter is well known. It is a pity that the limits of space have obliged him to deal with the subject so briefly, but many useful hints can be obtained from the descriptions he gives of his apparatus and methods.

The book is full of interest to all microscopists ; it abounds with useful suggestions, and will be recognized by all readers as the work of an accomplished practical expert.

H. J. Walton.

v. Ostertag (R.), Wolffhügel (K.), & Nöller (W.). **Die tierischen Parasiten der Haus- und Nutztiere. Band I. Die wichtigsten parasitischen Protozoen des Menschen und der Tiere,** von W. Nöller. **I. Teil. Einführung in die allgemeine Kenntnis und die Untersuchung der parasitischen Protozoen und Abschnitt I. Die parasitischen Rhizopoden.** [The Animal Parasites of Domestic and Useful Animals. Vol. I. The Most Important Parasitic Protozoa of Man and Animals, by W. Nöller. Part I. General Introduction and the Investigation of Parasitic Protozoa, and Section I. The Parasitic Rhizopods.] 8vo. pp. 1–272. With 113 figures in text and 3 coloured plates. 1922. Berlin ; Richard Schoetz. [Price M.450.]

This publication is the first instalment of a new German work which is to essay the ambitious programme of reviewing the animal parasites of domestic and industrially useful animals ; at least, so its general title implies. But a perusal of this first number indicates that its scope is yet wider, for we here find " domestic and useful animals " so interpreted as to include man, fish, insects, and any other animals which occur in human habitations and surroundings, or which are common objects of laboratory study. Even parasites of plants are at times embraced in this comprehensive system, while the term " parasite " itself has, it seems, been sufficiently expanded to include coprozoic, commensal, and even free-living forms. If the liberal treatment here accorded to the Rhizopods is to set the standard for the rest of the work, it is thus difficult to see where, or when, the publication will end ; and it is curious to reflect that there is probably no publisher outside Germany who would be willing or able to bring out, at the present time, a work of like scope on so lavish a scale and at such a price.

In its general get-up this part of the work is good. It is profusely, and, on the whole, well, illustrated ; and it is well printed on good paper. Not a few of the illustrations are new, and therefore possess an additional interest for those engaged in working at the subject with which the volume deals. Plate 3 may be specially noted, though it is a luxury rather than a necessity ; for its sole purpose is, apparently, to show some of the various colours that various protozoa may assume when stained in a variety of ways. Unfortunately there is no index, but this is a defect which is doubtless excusable by the fact that the present part is but the first of a series. For a work of this sort, moreover, the number of misprints is somewhat excessive—at least, several dozen having been noted.

The present part consists of two main sections—general and special. In the former, which is intended to serve as a general introduction to the study of the Protozoa, with special reference to the parasitic forms, there are four chapters, dealing, in order, with the morphology and life-histories of protozoa generally ; the technique of practical protozoology ; the cultivation of parasitic protozoa ; and the general systematics of the group. The second section then deals descriptively with the parasitic Rhizopoda, and each of the two main sections concludes with a long list of relevant references.

We may now, after this brief outline, consider the individual parts in more detail.

The general part follows familiar lines, and—perhaps for this very reason—contains many statements with which the present reviewer heartily disagrees. But some, at least, of these are undoubtedly erroneous. For example, the author, while he does but follow precedent in defining the Protozoa as "unicellular," adds further (p. 12) that, if one objects to this expression, one can also, "with SACHS and HARTMANN," regard the Protozoa as "non-cellular," contrasting them with the multicellular organisms, and dividing them into monoenergid and polyenergid forms according to the number of their nuclei, "as DOBELL does." A more perverse statement on this subject it would surely be hard to make. The truth is, of course, that the conception that the Protozoa are "non-cellular" originated with the last-named author, with whose views the "energid" hypothesis of SACHS, and the "poly-energid nuclei" of HARTMANN, have nothing to do. Neither of these two authors first called the Protozoa "non-cellular," and their own hypotheses are, indeed, not easily compatible with the conceptions involved in this expression. The above statement is so manifestly wrong that it would be hardly worth while to call attention to it, were it not that it is by no means an isolated instance of the way in which the author deals with the observations and views of others—especially of English workers. [Indeed, he misquotes and misrepresents the present reviewer's work and views—to take an instance—with such regularity, whenever he has occasion to mention them, that it seems probable that he either has not read his writings or else cannot read English accurately. That he has misrepresented them wilfully on so many occasions, the reviewer is unwilling to believe; though he cannot refrain from expressing a hope that those who are unacquainted with his work will—if it interest or concern them—read what he has himself written before accepting as his what Nöller attributes to him in this book.]

On the whole, the introductory sections are clearly written; but some of the matter contained in them is of a very elementary character, and appears to be designed for the use of persons who have never entered a laboratory or seen any of the apparatus usually employed in such a place. Consequently, some of the pages dealing with the microscope, and with such subjects as ordinary laboratory procedures, make tedious reading. The author, apparently, often assumes a complete ignorance in his readers—and even, at times, a lack of ordinary common sense. At least, this is the impression one gets from passages such as that (on p. 78) wherein one is told that a 1 per cent. alcoholic solution of hydrochloric acid can be made by adding 1 cc. of the acid to 100 cc. of alcohol. Another statement, in the same place, to the effect that a 5 per mille solution is made by adding 0·4 cc. of HCl to 100 cc. of alcohol, is, however, exempt from such criticism, as this is certainly not generally known.

Though elementary, the author's teaching is not invariably faultless. Some of his statements, for example, concerning cytological methods and theory will not command universal assent. Thus, he lays it down (p. 19) that staining is primarily a chemical and not a physical process; but this can hardly be regarded as an expression of the most competent and informed opinion at the present day—notwithstanding the author's appeal to experience in support of it. Again, the statement (p. 77) that haematoxylin "in a pure state" is a "red-brown crystalline powder" may be categorically contradicted; and many a reader will probably ask himself how far a writer capable of making such a statement can really be qualified to instruct others in the theory of cytological staining. English readers will be amused to learn (p. 55) that they should study the living organism—as well as stained preparations—because of SCHAUDINN's classical exhortation and example; and many of them will, no doubt, share the reviewer's surprise when they read (p. 64) that the making of wet films—in place of dry ones—was introduced into protozoology chiefly through

the efforts of HARTMANN and his school in Berlin. On p. 65 we are admonished to exercise extreme care (*peinlichst darauf zu achten*) to insure that our mounting medium—resins and oils are specifically indicated—"contains no traces of acid, and forms none in the course of time." Had the author told us how this may be done it would have been more helpful; but in the absence of his further instructions on this point, we can only assume that he is unaware of the chemical composition and reactions of Canada balsam and similar substances. A considerable number of other criticisms could easily be levelled at many other statements in the sections dealing with cytological technique; but as a whole this part will, no doubt, be helpful to beginners.

The section on the cultivation of parasitic protozoa (pp. 93–108) is one of the best in the book; and this is evidently because the author is here on ground which is personally more familiar to him. Some of the methods cited are, however, not above criticism (*e.g.*, ESCOMEL's method of cultivating *Trichomonas*, p. 99).

A short section on the classification of the Protozoa (pp. 108–112) contains nothing specially noteworthy—unless it be the grouping of the Ciliata and Suctoria in the Class "Infusoria *O. F. Müller*." The "Infusoria" of that admirable old Dane were something very different; but perhaps one ought not to expect strict accuracy in a matter of ancient zoological history from a very modern veterinarian.

References to Part I occupy a little over nine pages, and are preceded by a brief indication of the chief periodical and other works of reference dealing with parasitic protozoa. Among the conspicuous omissions here we may note the *Zoological Record*, the *Zoologischer Jahresbericht*, and STILES and HASSALL's *Index-Catalogue*. The first and last may, perhaps, have been intentionally left out owing to the author's evident preference for German literature. Only one French publication is mentioned—and that somewhat grudgingly.

The Special Part (pp. 125–272) deals systematically with the parasitic Rhizopods. We here find descriptions of the amoebae which have been found in man and domestic animals, and also of a number of coprozoic and free-living species. Even the Heliozoa and Mycetozoa come into consideration—the Vampyrellidae, which have little medical or veterinary interest, being included, and placed among the Heliozoa (in the reviewer's opinion, with little justification). Perhaps the most remarkable systematic novelty, however, is the inclusion of *Cercomonas*—under the alias of *Cercobodo*—among the "Rhizomastigidae." How this well-known genus of flagellates comes to be found in such strange company is difficult to understand; and the difficulty is increased when we find *Dimastigamoeba* given first as a synonym of *Cercobodo* (p. 216) and two pages later apparently treated as a subgenus of the same genus. It is clear that the author is either unfamiliar with these genera and the works of others dealing with them, or else holds revolutionary views on classification which he prefers not to make public. As they stand, his statements concerning "*Cercobodo*" appear to the reviewer to contain a series of gross blunders.

It is in the accounts of the amoebae of man and domestic animals, however, that readers of this *Bulletin* will be most interested. The author follows, for the most part, the reviewer's nomenclature and synonymy of these organisms: though this is not always obvious, for he usually does not note the fact, and is at times careful to indicate that he has reached an identical conclusion by a different route. In matters of history he is not invariably correct, and displays a noticeable bias. We are thus not surprised to find the names of LEWIS and CUNNINGHAM omitted from the historic note on *Entamoeba coli* (p. 189), and the names of WALKER, WENYON, DARLING, and others often lacking in places where they might, with propriety and truth, have at least been mentioned.

To the present reviewer, the sections dealing with *E. histolytica* and *E. coli* are particularly difficult to discuss briefly, because they contain

so many statements which he has himself elsewhere endeavoured to correct. It is, in his opinion, impossible to understand the life-histories of these organisms without knowing and understanding the work of WALKER, and some of the more recent English investigators; but it is clear that Nöller either has not read or has not understood this work—notwithstanding his frequent references to it. How completely he has failed to understand the reviewer's observations and views—to take but one instance—is clearly shown in the following sentence (p. 174): "DOBELL (1919) extends the views elaborated by SCHAUDINN (1903) in regard to the tissue parasitism of *E. histolytica*, to its *minuta* forms as well." [This involves a fundamental misconception of almost everything that the author mentioned—the present reviewer—has ever written on the life-cycle of this parasite. Not only does he not regard the "*minuta* forms" as tissue parasites, but he believes that nobody can understand the life-history of this species if he holds such a view.] Similar misconceptions of the opinions and observations of other workers mar much of what the author has to say regarding geographical distribution, pathology, treatment, and other subjects discussed in this section.

The description of *Iodamoeba* and *Endolimax nana* contain a number of statements, concerning nuclear structure and other points, which the reviewer regards as demonstrably incorrect. It is satisfactory to note, however, that "*Councilmania lafleuri*" is not accepted as a separate and valid species, and that "*Craigia*" is regarded with scepticism. "*Leydenia gammipara*" is treated, however, with a respect which it by no means merits—doubtless in deference to its inventor.

References to the "Literature on Rhizopods" occupy over 30 pages at the end of the volume. Little attempt seems to have been made to condense these, however, and some are duplications of those appended to the first section. They contain a by no means insignificant number of mistakes, moreover, and from the bibliographer's standpoint leave a good deal to be desired. Some of the abbreviations used are unfamiliar. The reviewer has received a very decided impression that the author has not always consulted the originals of the works which he cites, while his references include a good many memoirs whose contents receive little or no notice in the text.

It is neither possible nor necessary to enter into a more detailed discussion of the present work in this place, but a few concluding remarks may perhaps be allowed to a reviewer who has read the work with care and can claim to have some first-hand knowledge of all the subjects with which it deals. The general impression which he has gained is that the author's intentions have been excellent and his patriotism unimpeachable, but that his knowledge both of the Protozoa as a whole, and of many of the Rhizopods which he enumerates and discusses, is not profound. The reviewer cannot help thinking that if the author—who is better known for his work on blood-protozoa than for his contributions to our knowledge of amoebae and their next of kin—had spent more time in obtaining a first-hand acquaintance with many of the animals with which he deals, and had devoted more attention to reading many of the works which he cites, then he would have expressed opinions often very different from those here delivered. Nobody knows better than the reviewer how difficult it is to write a book on so complex a subject, and how much labour must go to its making; nevertheless, he closes this volume with a feeling of disappointment. He has learnt little from it though he had hoped to learn much. There is indeed hardly a page which does not appear to him to invite criticism or contradiction. But the work, as a whole, will doubtless have its uses, and will probably take a worthy place among that vast array of bulky, comprehensive, and useful—though often not too accurate—compilations which are so characteristic of the scientific output of Germany. Outside its country of origin, however, it is hardly likely to win enduring recognition as an authoritive exposition of the present state of knowledge of the parasitic Rhizopods.

Clifford Dobell.

GIMLETTE (John D.). **Malay Poisons and Charm Cures.**—pp. xii+260. With 2 plates. 2nd Edition. 1923. London: J. & A. Churchill, 7, Great Marlborough Street. [Price 8*s*. 6*d*. net.]

The first edition of this "curiose" book was reviewed in Vol. 6 of this *Bulletin*, pp. 111-112. The present edition covers the same ground, but so much more amply, in so much more detail, and in a manner so much more scholarly and artistic, as to be a new book improved almost out of recognition. From 127 small octavo pages it has swelled to 260 pages of large octavo, and its six chapters are increased to ten. Of the four new chapters, one is of an introductory kind, dealing in a general way with Malay methods of poisoning and subtle murderous predilections; the other three treat in interesting detail of charms, spells and amulets, necromancy and exorcism, and all the apparatus of the magician—matters which in the first edition did little more than give atmosphere and general effect. For the rest, there is a much fuller account of the Bomor—a medicine-man of that ever popular kind whose dour art and materia medica are strongly seasoned with magic—and the more prosaic chapters on poisons contain additional matter and are treated more scientifically. Another great improvement is the list of appropriate references adjoined to every chapter. In a "Foreword" by Sir W. WILLCOX the calamitous circumstances under which the author became grievously and permanently incapacitated in the discharge of his duties are feelingly referred to.

A. Alcock.

MACKENNA (Robert W.). **Diseases of the Skin. A Manual for Students and Practitioners.**—pp. ix+451. With 160 figs. 1923. London: Baillière, Tindall & Cox, 8, Henrietta Street, Covent Garden, W.C.2. [Price 21*s*. net.]

This is intended as a manual for students and practitioners and is well adapted to that end. An attempt at classification on strictly etiological rather than morphological lines is a novel feature of the book, and recent views on focal sepsis are very fully dealt with. The book reflects a wide personal experience, and is accordingly especially valuable in practical directions for treatment. Its convenient size and admirable illustrations and letterpress make it an altogether attractive volume and a welcome addition to text-books for the over-driven student of medicine of to-day.

E. G. Graham Little.

CLARKE (J. Jackson) [M.B. Lond., F.R.C.S., Senior Surgeon to the Hampstead and North-West London Hospital, and Surgeon to the Royal National Orthopaedic Hospital]. **Protists and Disease.** pp. xi + 229. With Frontispiece and 61 figs. 1922. London: Baillière, Tindall & Cox, 8, Henrietta Street, Covent Garden. [Price 15*s*. net.]

It must not be assumed from the title of this book that the author is presenting his readers with a general account of the relation of protists to disease. His intention is to trace the life-history of various algae, fungi and allied organisms with the object of demonstrating that the various enigmatical bodies which occur in the lesions of cancer, syphilis, molluscum contagiosum, small-pox and other conditions are best explained on the assumption that they represent stages in the evolution of vegetable organisms similar to those he has described. In many cases these bodies are devoid of nuclei, and the author discusses at some length the chromidium theory, adopting the view which is accepted by many protistologists that certain protists are devoid of true nuclei. The chromatin material occurs in the form of granules distributed through the cytoplasm and these may at certain stages of development become aggregated into true nuclei. As illustrations of this process he discusses the chromidia which have been

described in *Mastigella vitrea* and *Arcella vulgaris*, in both of which the origin of nuclei from chromidia has been recorded. It is, however, far from clear that any such process occurs in these protozoa. Another illustration is found in *Rhinosporidium*, in which a contractile vacuole is said to be present. The recent exhaustive account of this organism given by ASHWORTH proves that true nuclei are present at all stages of development, and that neither a chromidial phase nor a contractile vacuole occurs. It is probably correct that some of the lower protists do not possess organized nuclei, but it is unfortunate that the author should have selected as illustrations cases which are by no means well established.

Having convinced himself that the peculiar bodies already mentioned are allied to the algae or other vegetable organisms he describes, he is in difficulties in the case of syphilis to account for the well-known spirochaete, which he assumes to be the detached flagellum of a hypothetical flagellate stage.

The book is evidently written in all earnestness and sincerity and the author has faithfully recorded what he himself has seen. The majority of observations quoted are, however, those of other workers; many of them still require confirmation, while some of them are undoubtedly incorrect. The inevitable result of the author's line of argument is that he has been led into making assertions that are based on superficial resemblances alone and which require far more evidence to support them than he has been able to adduce. It may be said, however, that as the etiology of many of the diseases discussed is still obscure, he may have rendered a service in directing attention to a conception which has been frequently overlooked.

C. M. Wenyon.

BUISSON (Jean). **Les Infusoires ciliés du tube digestif de l'homme et des mammifères.**—204 pp. With 60 text figs. 1923. Paris: Amédée Legrand, 93 Boulevard Saint-Germain. [Price not stated.]

This is in the main a descriptive catalogue, fully illustrated by unpretentious and somewhat diagrammatic figures, of the ciliate infusoria that inhabit the alimentary tract of mammals, man included. It appears to be a most useful treatise, and for beginners its usefulness is increased by a chapter of simple instructions for the study of these organisms, a list of hosts, and a working bibliography.

A. Alcock.